1910 január [illegible] [illegible]

20

Vegyes ~~[illegible]~~ megfigyelések

1909 okt 22-23

II ~~Egyén~~ I cső — II állás

[illegible] 12 [illegible]

$n=150+x$ l	[illegible]	[illegible]	Számítva	
$\overline{7h}$ $+6{,}1 = x$	$-1{,}3\,y$	$-0{,}54\,z$	$+4{,}53 + 1{,}82 - 0{,}34 = +6{,}01$	$+0{,}09$
$\overline{1h}$ $+4{,}5 = x$	$+0{,}1\,y$	$+0{,}08\,z$	$+4{,}53 - 0{,}14 + 0{,}06 = +4{,}45$	$+0{,}05$
$\overline{4h}$ $+4{,}8 = x$	$-0{,}2\,y$	$+0{,}29\,z$	$+4{,}53 + 0{,}28 + 0{,}18 = +4{,}99$	$-0{,}19$
$\overline{7h}$ $+4{,}9 = x$	$0\,y$	$+0{,}46\,z$	$+4{,}53 \quad 0 \quad + 0{,}29 = +4{,}82$	$+0{,}08$
$10h$ $+3{,}0 = x$	$+1{,}3\,y$	$+0{,}61\,z$	$+4{,}53 - 1{,}82 + 0{,}38 = +3{,}09$	$-0{,}09$
$1h$ $+4{,}0 = x$	$+0{,}7\,y$	$+0{,}73\,z$	$+4{,}53 - 0{,}98 + 0{,}46 = +4{,}01$	$-0{,}01$
$\overline{7h}$ $+6{,}6 = x$	$-1{,}3\,y$	$+0{,}95\,z$	$+4{,}53 + 1{,}82 + 0{,}60 = +6{,}95$	$-0{,}35$
$\overline{10h}$ $+6{,}3 = x$	$-0{,}6\,y$	$+1{,}04\,z$	$+4{,}53 + 0{,}84 + 0{,}66 = +6{,}03$	$+0{,}27$
$\overline{1h}$ $+5{,}9 = x$	$-0{,}4\,y$	$+1{,}13\,z$	$+4{,}53 + 0{,}56 + 0{,}71 = +5{,}80$	$+0{,}10$
$\overline{4h}$ $+6{,}2 = x$	$-0{,}6\,y$	$+1{,}20\,z$	$+4{,}53 + 0{,}84 + 0{,}76 = +6{,}13$	$-0{,}07$

$[aa] = +10 \quad [ab] = -2{,}3 \quad [ac] = +5{,}95 \quad [al] = +52{,}3$

$[bb] = +6{,}49 \quad [bc] = -1{,}075 \quad bl = -20{,}18$

$[cc] = +6{,}1997 \quad [cl] = +32{,}391$

Normalegyenletek.

$$\left.\begin{array}{l|l} & 100000x - 23000y + 59500z = +523000 \\ 4{,}347827 & -23000x + 64900y - 10750z = -201800 \\ 1{,}680672 & +59500x - 10750y + 61997z = +323910 \end{array}\right\}$$

[illegible] $x = +4{,}5318$, $y = -1{,}3985$, $z = +0{,}6328$ — [illegible] $x = +4{,}53$, $y = -1{,}40$, $z = +0{,}63$

h egyenlet alakja $l = a + bx + cz$

akkor normalegyenletek

$$[aa]x + [ab]y + [ac]z = [al]$$
$$[ab]x + [bb]y + [bc]z = [bl]$$
$$[ac]x + [bc]y + [cc]z = [cl]$$

1909 Okt. 22-25. II Ertég I csö III állás

$h = 140 + x$

	l	a	b	c	Számított				
~~$\overline{5}$ h~~	~~+3,9~~	~~= x~~	~~−1,4y~~	~~−0,88z~~	~~= +1,75~~	~~+ 2,49~~	~~− 0,18~~	~~= +4,06~~	~~+0,16~~
8 h	+3,9	= x	−1,1y	−0,41z	= +1,75	+ 1,96	− 0,08	= +3,60	+0,30
11 h	+1,7	= x	+0,1y	−0,09z	= +1,75	− 0,18	− 0,02	= +1,55	+0,15
2 h	+1,6	= x	0	+0,15z	= +1,75	0	+ 0,03	= +1,78	−0,18
8 h	+1,6	= x	0	+0,51z	= +1,75	0	+ 0,10	= +1,88	−0,28
11 h	+0,1	= x	+1,2y	+0,65z	= +1,75	− 2,14	+ 0,13	= −0,27	+0,37
2 h	+0,5	= x	+0,8y	+0,77z	= +1,75	− 1,42	+ 0,15	= +0,48	+0,02
~~5 h~~	~~+2,6~~	~~= x~~	~~−0,9y~~	~~+0,88z~~	~~= +1,75~~	~~+ 1,60~~	~~+ 0,18~~	~~= +3,53~~	~~−0,93~~
$\overline{8}$ h	+4,6	= x	−1,5y	+0,98z	= +1,75	+ 2,67	+ 0,20	= +4,64	−0,04
$\overline{11}$ h	+3,4	= x	−0,6y	+1,07z	= +1,75	+ 1,06	+ 0,21	= +3,02	+0,38
$\overline{2}$ h	+3,2	= x	−0,5y	+1,15z	= +1,75	+ 0,89	+ 0,23	= +2,87	+0,33

[aa] = +11
+ 9

[ab] = −3,9 = −1,6
~~−1,6~~

[bb] = +8,46
+ 5,69

[ac] = + 4,78
+ 4,78

[bc] = −0,399
− 0,839

[cc] = +6,4315
~~+5,6971~~
+ 4,8827

[al] = +27,1
+ 20,6

[bl] = ~~−21,94~~
= −14,14

[cl] = +10,336
+11,480

Normálegyenletek.

$+110000x - 39000y + 47800z = +271000$

2,820513 | $-39000x + 84600y - 3990z = -219400$

2,301255 | $+47800x - 3990y + 64315z = +103360$

$x = +1,7767$

$y = -1,7788$

$z = +0,1986$

Próbaszámítás

$x = +1,75$

$y = -1,78$

$z = +0,20$

Normálegyenletek:

$90000x - 16000y + 47800z = +206000$ x =

$-16000x + 84600y - 8390z = -141400$ y =

$+47800x - 8390y + 48827z = +114800$ z =

1907 okt. 22-23 II Eszköz 1ső I állás

$n = 145 + x$

$\overline{6h}$	$+4{,}1 = x - 1{,}1y - 0{,}69z$
$\overline{9h}$	$+4{,}5 = x - 1{,}2y - 0{,}29z$
$\overline{12h}$	$+2{,}1 = x + 0{,}1y \quad 0$
$\overline{3h}$	$+2{,}5 = x - 0{,}1y + 0{,}22z$
$\overline{6h}$	$+2{,}7 = x - 0{,}4y + 0{,}41z$
$12h$	$+0{,}7 = x + 0{,}8y + 0{,}69z$
$\overline{6h}$	$+3{,}6 = x - 1{,}1y + 0{,}92z$
$\overline{9h}$	$+4{,}6 = x - 1{,}2y + 1{,}01z$
$\overline{12h}$	$+3{,}8 = x - 0{,}7y + 1{,}10z$
$\overline{3h}$	$+3{,}6 = x - 0{,}8y + 1{,}18z$

$[aa] =$ $\quad [ab] =$ $\quad [ac] =$ $\quad [al] =$

$[bb]$ $\quad [bc] =$ $\quad [bl] =$

$[cc] =$ $\quad [cl] =$

$$X = \int_0^b - \frac{ibc}{(a^2+c^2)\sqrt{a^2+b^2+c^2}}\, da\, dc = - \frac{ibc}{(a^2+c^2)\sqrt{a^2+b^2+c^2}}\, da\, dc$$

$$Z = \int_0^b + \frac{iba}{(a^2+c^2)\sqrt{a^2+b^2+c^2}}\, da\, dc = + \frac{iba}{(a^2+c^2)\sqrt{a^2+b^2+c^2}}\, da\, dc$$

integrálva a ra 0tól a ig.

$$X = -ibc\,dc \int_0^a \frac{1}{bc} \operatorname{arc\,tg} \frac{abc}{c^2\sqrt{a^2+b^2+c^2}} = -i\,dc \operatorname{arc\,tg} \frac{ab}{c\sqrt{a^2+b^2+c^2}}$$

$$Z = +ibdc \int_0^a \frac{a\,da}{(a^2+c^2)\sqrt{a^2+b^2+c^2}} = +ibdc \left|\frac{1}{b} \log \frac{\sqrt{a^2+b^2+c^2} - b}{\sqrt{a^2+c^2}}\right|_0^a$$

$b = 1$ $f = c^2$

$a = (b^2+c^2)$ $g = 1$

$bf^2 - afg = c^4 - (b^2+c^2)c^2$

neg.

$afg - bf^2 = (b^2+c^2)c^2 - c^4$

$= b^2c^2$

$ag^2 - bfg = (b^2+c^2) - c^2 = b^2$

$$Z = +i\,dc \left\{ \log \frac{\sqrt{a^2+b^2+c^2} - b}{\sqrt{a^2+c^2}} - \log \frac{\sqrt{b^2+c^2} - b}{c} \right.$$

$\mathcal{U} = 0{,}21$

II. alin $\dfrac{\partial \cancel{X}}{\partial \cancel{Z}} = -k\pi\mathcal{U}\,\rho^2\left(\dfrac{1}{(\rho^2+c^2)^{\frac{3}{2}}} - \dfrac{1}{(\rho^2+c'^2)^{\frac{3}{2}}}\right)$

$\dfrac{1}{(200)^{\frac{3}{2}}} - \dfrac{1}{(500)^{\frac{3}{2}}}$

$\dfrac{1}{2744} - \dfrac{1}{10648}$

12, 1.

3.

$240 \cdot 10^{-9} = k\,\dfrac{\cancel{60}}{2700}$

$\cancel{4 \cdot 2700 \cdot 10^{-4}}$

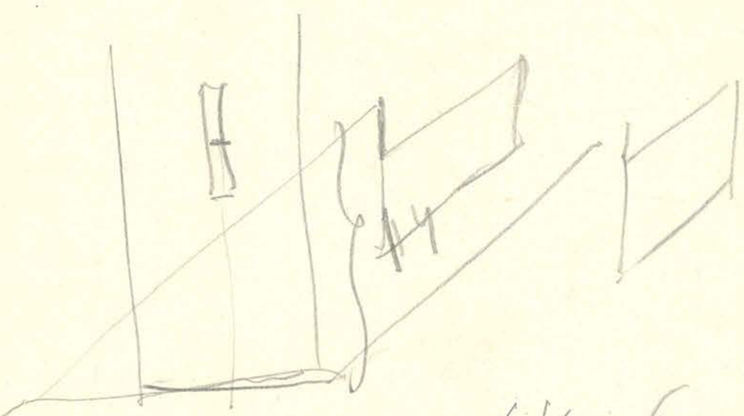
$10080 \cdot 10^{-9}$

12, 1

8, 8

$\dfrac{26}{81}$

$\dfrac{107}{93}$



$\dfrac{50}{121}\Big|\dfrac{33}{880}\Big|\dfrac{0{,}66}{0{,}73}$

84 / 50

275   14. 6.

14)

327,65   847,49

2,515410   2,926034

1,257705   1,463017

3,773115   4,389051

0,226885-4   0,610949-5

$\rho = 10{,}7$ $z_2 = 27{,}0$

$h = 12{,}4$ $z_1 = 14{,}6$

$114{,}49\left(\dfrac{1}{(114{,}49+213{,}16)^{\frac{3}{2}}} - \dfrac{1}{(114{,}49+729{,}00)^{\frac{3}{2}}}\right)$

0,0001686 1   —   0,00009082

9082

2,058768

0,106497 -4

0,165265. -2

315

6,00

31

6,61

$114{,}49 \cdot 0{,}00012779 = 0{,}014631$

---

a fürdőn túl

$100\left(\dfrac{1}{(100+420{,}25)^{\frac{3}{2}}} - \dfrac{1}{(100+870{,}25)^{\frac{3}{2}}}\right)$

2,716212   2,986884

1,358106   1,493442

4,074318   4,480326

0,925682-5   0,519674-5

0,00008427   0,0003310

3310

$100 \cdot 0{,}00005117 = 0{,}005117$

$k \cdot 0{,}003412 = \dfrac{1}{6m}^{300} = \dfrac{50}{m}$

1706

3382

$\rho = 10{,}7$ $h = 12{,}4$ $z_1 = 12{,}1$ $z_2 = 24{,}5$

$\rho^2\left(\dfrac{1}{(\rho^2+c^2)^{\frac{3}{2}}} - \dfrac{1}{(\rho^2+c'^2)^{\frac{3}{2}}}\right) = 114{,}49\left(\dfrac{1}{260{,}90^{\frac{3}{2}}} - \dfrac{1}{714{,}74^{\frac{3}{2}}}\right)$

$\dfrac{\partial Z}{\partial x} = -0{,}01397\,k.$

Coordinata hordozza a mágneses pólus.

Elektromos pont összeredője: $A \quad B=0 \quad C=\mathfrak{H}$

Mágneses elem összeredője: $a\ b\ c$

$\rho \qquad A$

$\mathfrak{H}$

$$\frac{\partial Y}{\partial z} = 3\, i_x \frac{\cancel{bc}\, c^2}{\rho^5}\, dV - 3\, i_z \frac{a^2 c}{\rho^5} dV - i_{\cancel{x}} \frac{1}{\rho^3}\, dV =$$

$$\rho^2 = a^2 + b^2 + c^2 \qquad dV = da\, db\, dc$$

$$\cancel{i_x = \frac{\quad}{(A-a)^2}} \qquad i_x = \frac{i}{4\pi} \frac{(a-A)}{\left((a-A)^2 + b^2 + (c-\mathfrak{H})^2\right)^{\frac{3}{2}}} \qquad i_z = \frac{i}{4\pi} \frac{c-\mathfrak{H}}{\left((a-A)^2 + b^2 + (c-\mathfrak{H})^2\right)^{\frac{3}{2}}}$$

$$\cancel{\frac{\partial Y}{\partial z} = \frac{i}{4\pi} \frac{3(a-A)bc - 3(a^2)(c-\mathfrak{H}) - (a-A)(a^2+b^2+c^2)}{\rho^5} dV}$$

$$\cancel{3abc - 3a^2c - a^3 - ab^2 - ac^2} \qquad \cancel{a(3bc - ac - a)} - b^2 - c^2$$

$$- 3Abc + 3a^2\mathfrak{H} + Aa^2 + Ab^2 + Ac^2$$

$$\frac{\partial Y}{\partial z} = \frac{i}{4\pi} \frac{3(a-A)c^2 - 3(c-\mathfrak{H})ac - (a-A)(a^2+b^2+c^2)}{\rho^5}$$

$$-3Ac^2 + 3\mathfrak{H}ac - a^3 - ab^2 - ac^2 + A(a^2+b^2+c^2)$$

$$\frac{A(a^2+b^2-2c^2) + 3\mathfrak{H}ac + a(a^2+b^2+c^2)}{\rho^5}$$

$$\frac{\partial Y}{\partial z} = \frac{i}{4\pi} \left\{ \frac{a}{\rho^3} + A \frac{a^2+b^2}{\rho^5} - 2A \frac{c^2}{\rho^5} + 3\mathfrak{H} \frac{ac}{\rho^5} \right\} \frac{dV}{\left((a-A)^2 + b^2 + (c-\mathfrak{H})^2\right)^{\frac{3}{2}}}$$

c marad $\quad a = r\cos\lambda \quad b = r\sin\lambda$

$dV = r\,dr\,d\lambda\,dc$

$$\rho^2 = r^2 + c^2$$

$$(a-A)^2 + b^2 + (c-\mathfrak{H})^2 = r^2 - 2Ar\cos\lambda + \left((c-\mathfrak{H})^2 + A^2\right)$$

$$\frac{\partial Y}{\partial z} = \frac{i\,dc}{4\pi} \left\{ \iint \frac{r^2\cos\lambda\, dr\, d\lambda}{(r^2+c^2)^{\frac{3}{2}}} \frac{1}{\left(((c-\mathfrak{H})^2+A^2) - 2A\cos\lambda\, r + r^2\right)^{\frac{3}{2}}} + A \iint \frac{r^3\, dr\, d\lambda}{(r^2+c^2)^{\frac{5}{2}} \left(((c-\mathfrak{H})^2+A^2) - 2A\cos\lambda\, r + r^2\right)^{\frac{3}{2}}} \right.$$

$$\left. -2Ac^2 \iint \frac{r\, dr\, d\lambda}{(r^2+c^2)^{\frac{5}{2}} \left(((c-\mathfrak{H})^2+A^2) - 2A\cos\lambda\, r + r^2\right)^{\frac{3}{2}}} + 3\mathfrak{H}c \iint \frac{r^2\, dr\, d\lambda}{(r^2+c^2)^{\frac{5}{2}} \left(((c-\mathfrak{H})^2+A^2) - 2A\cos\lambda\, r + r^2\right)^{\frac{3}{2}}} \right\}$$

350 88   26[illegible]   251 84   168[illegible] 40[illegible]   [illegible]

III	163,[illegible]								
I	160,8	14,5	164,83	−4,03	−4,08 $^{\pm 0,12}$	+0,05	0,0025	[illegible]	±0,20
II	170,6	14,6	164,87	+5,73	+5,88 $^{\pm 0,08}$	−0,15		[illegible]	±0,15
III	163,2	14,3	164,77	−1,57	−1,83 $^{\pm 0,18}$	+0,26		[illegible]	±0,25
I	160,5	14,5	164,83	−4,33		−0,25	0,0625		
II	170,8	14,5	164,83	+5,97	−0,03[illegible]	+0,09			
III	163,2	14,9	164,97	−1,77		+0,06			
I	160,9	15,2	165,07	−4,17		−0,09	0,0081		
II	171,1	15,0	165,00	+6,10		+0,22			
III	163,0	15,5	165,17	−2,17		−0,34			
I	161,4	15,6	165,20	−3,80		+0,28	0,0784		
II	171,2	16,2	165,40	+5,80		−0,08			
III	163,6								

I	160,7						
II	170,9	14,8	164,93	+5,97	+5,92 $^{\pm 0,03}$	+0,05	±0,05
III	163,2	14,9	164,97	−1,77	−1,81 $^{\pm 0,04}$	+0,04	±0,06
I	160,8	14,8	164,93	−4,13	−4,09 $^{\pm 0,04}$	−0,04	±0,06
II	170,8	14,8	164,93	+5,87		−0,05	
III	163,2	14,9	164,97	−1,77		+0,04	
I	160,9	15,1	165,03	−4,13		−0,04	
II	171,0	15,1	165,03	+5,97		+0,05	
III	163,2	15,3	165,10	−1,90		−0,09	
I	161,1	15,3	165,10	−4,00		+0,09	
II	171,0	15,4	165,13	+5,87		−0,05	
III	163,3						

$n_1 - n_0$

I $n_1 = n_0 + v_1 + v_1 \beta$ n

II $n_2 = n_0 + v_2 + v_2 \beta$ $\frac{n_1+n_2+n_3}{3} = n_0 + \beta\frac{(v_1+v_2+v_3)}{3}$

III $n_3 = n_0 + v_3 + v_3 \beta$

$$n_2 - \frac{n_1+n_2+n_3}{3} = v_2 + \left(v_2 - \frac{v_1+v_2+v_3}{3}\right)\beta.$$

$$\left(v_2 + v_3 + v_1' - \frac{v_1+v_2+v_3}{3} - \frac{v_2+v_3+v_1'}{3} - \frac{v_3+v_1'+v_2'}{3}\right)\beta.$$

$$\mathrm{Sum} = \left(\frac{v_2}{3} - \frac{v_1'}{3} - \frac{v_2'}{3}\right) + \frac{v_1}{3}\beta$$

$n_r - n_{r\,10}$

$N = 165.$ $n - N.$

10^0

$N.$

$$n_r - n_0 = \alpha v(n-N) + \beta v_1^2 (n-N)$$
$$= \alpha v(n-N) + \alpha v(N-N) + \beta v^2(n-N) - \beta v^2(N-N)$$

n	$v.$	$n-165$	$(n-165)v$	$(n-165)v^2$

N

Ms 5103/7

I számú Oprav. eszköz a mágneses szobában.

Bádog és üveg hengerrel körülvéve. Desarretálva 11h 0m kor.

12h 30m	438'3	10'8	10'7
1h 0m	438'3	10'7	10'4
5h 0m	438'6	10'3	10'1

A két henger közötti közt vízzel töltöttem meg
Elkészült 5h 10m kor.

5h 30m	439'9	10'4	20'0
6h 0m	436'8	10'7	18'5
6h 30m	435'7	10'8	16'8
7h 0m	435'7	10'9	15'7
7h 30m	436'0	11'0	14'7
8h 0m	436'4	11'0	14'0
8h 25m	426,6	10,9	13,5
Ápr. 5 r. 7h 40	438,8	10,4	10,0
9h 15m	438'8	10'2	10'0
10h 0m	438'8	10'2	10'0
11h 0m	438'9	10'2	10'0

ápr 6. d.e. A vizet leürítettük és a torzió fejet elforgattuk.

3h 0m	481'7	11'0	10'7
20m	481'7	11'0	10'7

Vizet öntöttem be. Elkészült 3h 25m kor

4h om	486·3	11·2	19·1
30m	484·1	11·3	17·8
5h om	482·9	11·5	16·3
30m	482·1	11·4	15·7
6h om	481·9	11·3	14·7
7h om	481·8	11·3	13·5
8h om	481·7	11·3	12·8
ápr 7.			
10h om	481·8	11·1	11·0

Baktérium entkőz 1930 máj 9. 36° ó

Elindítottam 6h 0m kor (saját órámmal egyezik)

Megmozgattam 6h 30m kor

" " 8h 30 m kor

Levettem máj 10. — d.e. 10h 0m kor. (11h 0m)

Elindítottam 1h 25m kor.

Megmozgattam 2h 15m kor

" 3h 25m kor

Levettem 5h 30m kor (5h 10m)

Elindítottam 6h 10m kor.

Megmozgattam 7h 25m kor

Akkumulátor csere 3h 0m kor

Levettem 10h 45m kor máj 11. d.e. (10h 25m)

Isolar lemez

Elindítottam máj 11 d.e. 12h 25m kor

Megmozgattam 1h 10m kor.

Levettem 4h 10m kor

Mágnes a kémiai laboratoriumban a fülkében felfüggesztve.

1909 dec 20.

Elforgattuk 5h 3m kor

5h 40m kor kb. 8-9 o.r. leng. 271 körül

Elcsavartam.

6h 20m 251 körül leng.

7h 0m 254 " "

~~7h 20m~~ 8h 0m 253 - 261 - 257

257,6 - 257,2 - 228,0

1h 30m 263 - 263.7 - 263

Dec. 21 r. 7h 30

261 - 274 - 260

9h 30m

261 - 275 - 259

10h 30m

270 - 266 - 269

11h. 30m.

271.5 - 262.0 - 272.0

12h 30m

263.8 270.4 263.2

1h 30 271,8 265,2 270,8

2h 30m

277,0 254,2 276,2

3h 30m

270,0 260,1 270,8

4h 30m

261,5 274,0 260,8

5h 30m

269,1 265,7 269,0

6h 30m

262,2 276,8 262,0

7h 30m

264,8 274,0 266,5

8h 30m

275,0 27,18 275,6

2h 50m 271.6 - 271.7 - 271.6

Dec. 22

r. 7h 30 272 282,5 271,2

9h 30m			
	272,0	282,8	271.8
10h 30			
	286.8	275.7	287.0
11h 30m			
	284,3	279,2	285,0
12h 30m			
	279,2	281,9	278,9
2h 30m			
	274,4	286,0	276.0
3h 30m.	277.0	287.0	276.0
4h 30m			
	280,2	285,8	279,2
5h 30m			
	286,1	281,7	285,3
2h 50m	278.3	279.7	278.9
Dec. 23			
r. 7h 35m	291,4	287,0	290,6
10h 30m			
	279,2	290,0	279,4
11h 30m			
	293,7	274,0	292,1
12h 30m			
	281,8	284,3	282,3
1h 30m			
	291,3	277,3	290,3
2h. 30m →	288.0	283.9	289.5
3h. 30 –	282.5	288.0	281.8
5h. 30'	283.1	290.4	284.0
6h. 30m.	282.1	290.8	280.8

12h 20m 281.8 – 292.7 – 281.8

120° torziószög

Skálatávol 177·8 (88·9) 0·025 kg/mm

17, 680

233
430

0·2·620 g
0·4·836 g

14° 41
25° 49
40° 30

20° 15′

Elektrol.

Eltolás

Északi lemez.

~~16~~ 4
12

11cm 5cm

14 cm

389·2

70cm

397·2	12h 15	~~376~~	379
394·2	12h 25	~~428~~	414
395·1	12h 35	450 304	793 397

0·019, északi lemez.

396·5
372·0
403·0
377·0
398·5
371·5

399·3 373·5

149·3 123·5

1° 17′

Skálatávol 109·4 (54·7)

0·0206 mm. Phosphorbronz 0·024 = τ.
4

45cm hosszú

déli lemez.

~~105·0~~
~~124·5~~
178·5
189·0
168·0
~~158·0~~
~~174·5~~
194·0
~~154·0~~
176·5
~~166·0~~
193·5

174·3 193·2

75·7 56·8

0° 59′

0'025 drót déli lem.

63'0	
	239'0
68'0	
	242'0
61'0	243'0
64'0	241'3
186'0	0'87

8° 56'

0'025 drót északi lem.

75'0	
	371'5
75'5	
	377'5
78'0	374'5
76'2	374'5
173'8	124'5

15° 14'

114 ~~2397~~ ~~2398~~ } Kimaradt. 1274

50625.
189776 9.16

8956
8264
7

2570

589
331
258

6.914
5.892
102

0.2667

260
293

7682
6914
77

5892
4838

1050

6 ~~970~~ (5)

2000093.

838
655
183

3.50

81
3 | 210

0.2

916
6.661
255

{ 0.15 m ~~hez~~ ~~0.0065~~
~~15 cm hosszú~~

~~10 cm hosszú és~~
~~0.015 m Keresztmetszetű foszfor-~~
~~bronz drótra~~
$\tau = 0.0293$

20 mm átmérőjű. 0.5 mm vastag tükör

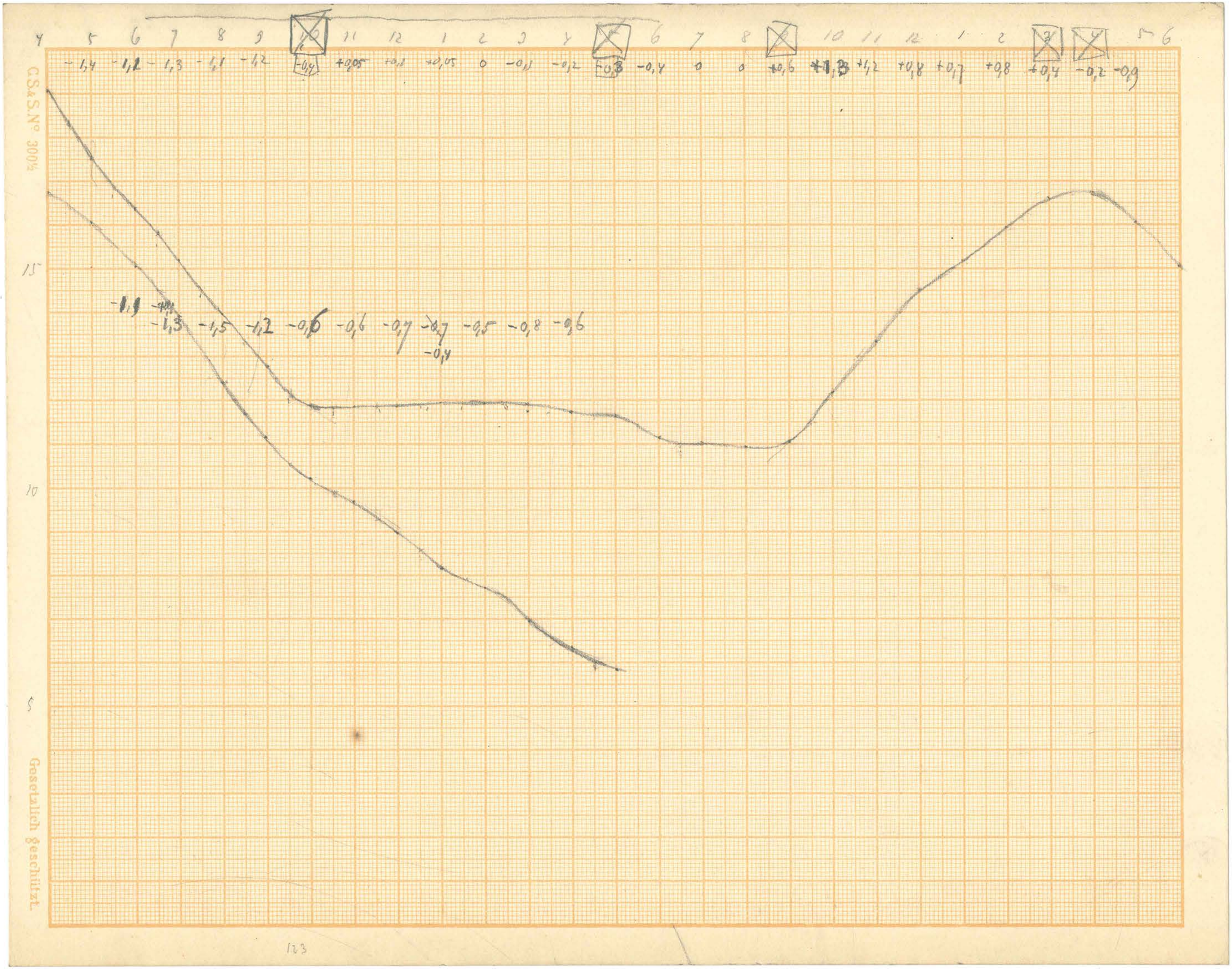
Nachrichten von der Königl. Gesellschaft der Wissenschaften zu Göttingen. 1909. Heft 1.

$25.2 \quad \frac{n}{1000} \Big| \quad \frac{x}{1000} = \frac{1}{57}$ $\quad \frac{1000}{430}$ 57 (18) $\quad 14^\circ$

0.0593 2.81 0.0104

109

2 kötet előfizetésnél
550 Kor ~~Kézpénzért~~


G.S.& S. No 300½
Gesetzlich geschützt.
15
10
5

II Ers[illegible] 1 Grö [illegible] 22-23

					v	yv y=-1,5	n		
4h	II	155,0							
5h	III	143,9	149,33	-5,43	$\boxed{-1,4}$	+2,10	141,80	147,77	-5,97
6h	I	149,1	149,70	-0,60	-1,1	+1,65	147,45	147,92	-0,47
7h	II	156,1	149,70	+6,40	-1,3	+1,95	154,15	148,00	+6,15
8h	III	143,9	149,83	-5,93	-1,1	+1,65	142,25	148,32	-6,07
9h	I	149,5	149,67	-0,17	-1,2	+1,8	147,70	148,32	-0,62
10h	II	155,6	148,93	+6,67	-0,4	+0,6	155,00	148,13	+6,87
11h	III	141,7	148,13	-6,43	0	0	141,70	147,98	-6,28
12h	I	147,1	147,77	-0,67	+0,1	-0,15	147,25	147,87	-0,65
1h	II	154,5	147,74	+6,76	+0,1	-0,15	154,65	147,83	+6,82
2h	III	141,6	148,20	-6,60	0	0	141,60	147,87	-6,27
3h	I	147,5	147,97	-0,47	-0,1	+0,15	147,35	147,82	-0,47
4h	II	154,8	148,03	+6,77	-0,2	+0,30	154,50	147,70	+6,80
5h	III	141,8	148,10	-6,30	-0,3	+0,45	141,35	147,65	-6,30
6h	I	147,7	148,13	-0,43	-0,4	+0,60	147,10	147,78	-0,68
7h	II	154,9	148,07	+6,83	0	0	154,90	147,87	+7,03
8h	III	141,6	147,90	-6,30	0	0	141,60	148,10	-6,50
9h	I	146,9	147,17	-0,27	+0,6	-0,90	147,80	148,12	-0,32
10h	II	153,0	146,67	+6,33	+1,3	-1,95	154,95	148,22	+6,73
11h	III	140,1	146,27	-6,17	+1,2	-1,80	141,90	147,92	-6,02
12h	I	145,7	146,60	-0,90	+0,8	-1,20	146,90	147,98	-1,08
1h	II	154,0	146,73	+7,27	+0,7	-1,05	155,05	147,88	+7,17
2h	III	140,5	147,00	-6,50	+0,8	-1,20	141,70	147,98	-6,28
3h	I	146,5	147,30	-0,80	+0,4	-0,60	147,10	147,80	-0,70
4h	II	154,9	148,00	+6,90	-0,2	+0,30	154,60	147,65	+6,95
5h	III	142,6	148,70	-6,10	$\boxed{-0,9}$	+1,35	141,25	147,60	-6,35
6h	I	148,6	149,27	-0,67	$\boxed{-1,1}$	+1,65	146,95	147,62	-0,67
7h	II	156,6	149,93	+6,67	-1,3	+1,95	154,65	147,98	+6,67
8h	III	144,6	150,27	-5,67	-1,5	+2,25	142,35	148,27	-5,92
9h	I	149,6	150,17	-0,57	-1,2	+1,80	147,80	148,52	-0,72
10h	II	156,3	149,77	+6,53	-0,6	+0,90	155,40	148,57	+6,93
11h	III	143,4	149,50	-6,10	-0,6	+0,90	142,50	148,55	-6,05

					v	yv $y=-1{,}5$			
12h	I	148,8	149,37	−0,57	−0,7	+1,05	147,75	148,50	−0,75
1h	II	155,9	149,30	+6,60	−0,4	+0,60	155,30	148,50	+6,80
2h	III	143,2	149,23	−6,03	−0,5	+0,75	142,45	148,38	−5,93
3h	I	148,6	149,33	−0,73	−0,8	+1,20	147,40	148,28	−0,98
4h	II	156,2	149,33	+6,87	−0,6	+0,90	155,30		
5h	III	143,2							

$x = n_0$ $y = (t_{pinceágy} - t_{előbbi})_{...}$ $z = t_{felső} - t_{belső}$

1909 okt. 22-23 Bajától Delre.

II állás

óra	$n = 150+$ -1										
7h.	6,1	= x	−1,15 y (−1,3)	−0,7 z	4,4	−0,6	6,7	−0,3	6,4
10h	5,6	= x	−0,8 y (−0,7)	0.2	4,4	−0,3	5,9	−0,4	6,0
1h	4,5	= x	0 y (0)	0,2	4,5	−0,3	4,8	−0,3	4,8
4h	4,8	= x	−0,1 y (−0,3)	0,2	4,6	−0,4	5,2	−0,1	4,9
7h	4,9	= x	−0,1 y (0)	+0,1 z	4,7	0	4,9	−0,1	5,0
10h	3,0	= x	+1,0 y (+1,3)	+1,8 z	4,8	+0,1	2,9	−0,3	3,3
1h	4,0	= x	+0,9 y (+0,7)	+1,3 z	5,0	+0,2	3,8	+0,5	3,5
4h	4,9	= x	0 y (0)	+0,3 z	4,9	+0,1	4,8	+0,1	4,8
7h	6,6	= x	−1,0 y (−1,3)	−0,9 z	5,1	−0,1	6,7	+0,3	6,3
10h	6,3	= x	−0,9 y (−0,7)	−0,4 z	5,3	+0,5	5,8	+0,2	6,1
1h	5,9	= x	−0,55 y (−0,7)	−0,6 z	5,1	+0,1	5,8	+0,3	5,6
4h	6,2	= x	−0,45 y (−0,6)	−0,4 z	5,4	+0,5	5,7	+0,2	5,5

Normal egyenletek

$[aa]x + [ab]y + [ac]z + [al] = 0$

$[ab]x + [bb]y + [bc]z + [bl] = 0$

$[ac]x + [cb]y + [cc]z + [cl] = 0$

$[aa] = 12,$ $[ab] = -3,15$ $[ac] = +0,5$ $[al] = -63,0$

$[bb] = +6,1075$ $[bc] = +5,545$ $[bl] = +24,17$

$[cc] = +7,01$ $[cl] = +6,21$

Normal egyenletek.

1,9,297	$+1200x - 315y + 50z = +6300$	$+2376,4x + 96,985z = 12220,11$
~~1,9,297~~	$-315x + 611y + 555z = -2417$	$-315,0x + 555z = -2417,00$
1,10090	$+50x + 555y + 701z = -621$	$+55,045x + 771,7309z = -683,66$

ezekből $x = +5,1606$

$y = -0,4826$

$z = -0,8947$

ha $c = 0$ lesz akkor

$x = +4,8708$

$y = -1,4446$

$\frac{dn}{dt} = \frac{c}{t}$ $n = C \log t$

t			
0			
1	0	−2,4849	
2	0,6931	−1,7918	
3	1,0986	−1,3863	
4	1,3863	−1,0986	4h
5	1,6094	−0,8755	5h
6	1,7918	−0,6931	6h
7	1,9459	−0,5390	7h
8	2,0794	−0,4055	8h
9	2,1972	−0,2877	9h
10	2,3026	−0,1823	10h
11	2,3979	−0,0870	11h
12	2,4849	0	12h
13	2,5649	+0,0800	1h
14	2,6391	+0,1542	2h
15	2,7081	+0,2232	3h
16	2,7726	+0,2877	4h
17	2,8332	+0,3483	5h
18	2,8904	+0,4055	6h
19	2,9444	+0,4595	7h
20	2,9957	+0,5108	8h
21	3,0445	+0,5596	9h
22	3,0910	+0,6061	10h
23	3,1355	+0,6506	11h
24	3,1781	+0,6932	12h
25	3,2189	+0,7340	1h
26	3,2581	+0,7742	2h
27	3,2958	+0,8109	3h
28	3,3322	+0,8473	4h
29	3,3673	+0,8824	5h
30	3,4012	+0,9163	6h
31	3,4340	+0,9491	7h

$n - n_0 = C(\log t - \log t_0)$

t			
32	3,4657	+0,9808	8h
33	3,4965	+1,0116	9h
34	3,5264	+1,0415	10h
35	3,5553	+1,0704	11h
36	3,5835	+1,0986	12h
37	3,6109	+1,1260	1h
38	3,6376	+1,1527	2h
39	3,6636	+1,1787	3h
40	3,6889	+1,2040	4h
41	3,7136	+1,2287	5h
42	3,7377	+1,2528	6h
43	3,7612	+1,2763	7h
44	3,7842	+1,2993	8h
45	3,8067	+1,3218	9h
46	3,8286	+1,3437	10h
47	3,8501	+1,3652	11h
48	3,8712	+1,3863	12h

~~$a_1 = -\infty$~~ ~~a_2~~

$b_1 = -\infty \qquad b_2 = +\infty$

$(a_2-a_1)(b_2-b_1)\log$

$$X = i_y\, dc\left\{\operatorname{arctg}\frac{a_1}{c} - \operatorname{arctg}\frac{a_2}{c} + \operatorname{arctg}\frac{a_1}{c} - \operatorname{arctg}\frac{a_2}{c}\right\} = 2 i_y\, dc\left\{\operatorname{arctg}\frac{a_1}{c} - \operatorname{arctg}\frac{a_2}{c}\right\}$$

~~$i_z dc$~~

$$Y = 2 i_x\, dc\left\{\operatorname{arctg}\frac{a_2}{c} - \operatorname{arctg}\frac{a_1}{c}\right\} + i_z\, dc\left\{\log\frac{\sqrt{a_2^2+b_1^2+c^2}-b_1}{\sqrt{a_1^2+b_1^2+c^2}-b_1} + \log\frac{\sqrt{a_1^2+b_2^2+c^2}-b_2}{\sqrt{a_2^2+b_2^2+c^2}-b_2}\right\}$$

$$Z = i_y\, dc\left\{\log\frac{\sqrt{a_1^2+b_1^2+c^2}-b_1}{\sqrt{a_2^2+b_1^2+c^2}-b_1} - \log\frac{\sqrt{a_1^2+b_2^2+c^2}-b_2}{\sqrt{a_2^2+b_2^2+c^2}-b_2}\right\}$$

$$\sqrt{a_2^2+b_1^2+c^2} = b_1 + \frac{1}{2}\frac{a_2^2+c^2}{b_1^2}$$

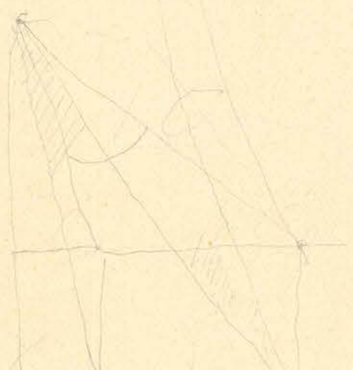
$$b_1 = -\infty \quad \left|\ \log\frac{\sqrt{a_2^2+b_1^2+c^2}-b_1}{\sqrt{a_1^2+b_1^2+c^2}-b_1} = 0\ \right| \qquad \log\frac{\sqrt{a_1^2+b_2^2+c^2}-b_2}{\sqrt{a_2^2+b_2^2+c^2}-b_2} = \log\frac{a_1^2+c^2}{a_2^2+c^2}$$

$$\log\frac{\sqrt{a_2^2+b_1^2}}{\sqrt{a_1^2+b_1^2}} = \log\frac{b_1\left(1+\frac{1}{2}\frac{a_2^2}{b_1^2}\right)}{b_1\left(1+\frac{1}{2}\frac{a_1^2}{b_1^2}\right)} = \frac{1}{2}\frac{a_2^2}{b_1^2} - \frac{1}{2}\frac{a_1^2}{b_1^2}$$

$$\begin{cases} X = 2 i_y\, dc\left\{\operatorname{arctg}\frac{a_1}{c} - \operatorname{arctg}\frac{a_2}{c}\right\} \\ Y = \cancel{2 i_x\, dc\left\{\operatorname{arctg}\frac{a_2}{c} - \operatorname{arctg}\frac{a_1}{c}\right\}} + i_z\, dc \log\frac{a_1^2+c^2}{a_2^2+c^2} \\ Z = i_y\, dc \log\frac{a_2^2+c^2}{a_1^2+c^2} \end{cases}$$

$b_1 = 0 \qquad b_2 = +\infty$

$$Z = i_x\, dc\left\{\log\frac{a_1}{a_2} + \log\frac{a_1^2+c^2}{a_2^2+c^2} + \log\frac{\sqrt{a_2^2+c^2}-a_2}{\log\sqrt{a_1^2+c^2}-a_1}\right\}$$
$$+ i_y\, dc\left\{\log\frac{a_2}{a_1} + \log\frac{a_1^2+c^2}{a_1^2+c^2} - \log\frac{\sqrt{a_2^2+c^2}}{\sqrt{a_1^2+c^2}}\right\}$$



$(b_2 b_1)(c_2 - c_1)$

$X = i_y da \left\{ -\log \frac{a^2+c_2^2}{a^2+c_1^2} \right\}$

$Y = i_x da \log \frac{a^2+c_1^2}{a^2+c_2^2} + 2 i_z da \left(\operatorname{arctg} \frac{c_1}{a} - \operatorname{arctg} \frac{c_2}{a} \right)$

$Z = 2 i_y da \left\{ \operatorname{arctg} \frac{c_2}{a} - \operatorname{arctg} \frac{c_1}{a} \right)$

$(a_2 - a_1)(c_2 - c_1)$

$X = \cancel{i_y db} \quad 0$

$Y = \cancel{i_x db} \quad 0$

$Z = 0$

3264 | 4264 | 1,27
3264 104
9000 116
6128 29
2272 1044
232

.4269 / 7269

5 10

$(a_2 - a_1)(b_2 - b_1)$

$X = 2 i_y dc \left\{ \operatorname{arctg} \frac{a_1}{c} - \operatorname{arctg} \frac{a_2}{c} \right\}$

$Y = 2 i_x dc \left\{ \operatorname{arctg} \frac{a_2}{c} - \operatorname{arctg} \frac{a_1}{c} \right\} + i_z dc \log \frac{a_1^2+c^2}{a_2^2+c^2}$

$Z = i_y dc \log \frac{a_2^2+c^2}{a_1^2+c^2}$

$(a_2 - a_1)(c_2 - c_1)$

$X = 0 \qquad Y = 0 \qquad Z = 0$

$(b_2 - b_1)(c_2 - c_1)$ lang

$\frac{\partial Z}{\partial x} = \frac{\partial X}{\partial z}$

$X = i_y da \log \frac{a^2+c_1^2}{a^2+c_2^2}$

$Y = i_x da \log \frac{a^2+c_1^2}{a^2+c_2^2} + 2 i_z da \left(\operatorname{arctg} \frac{c_1}{a} - \operatorname{arctg} \frac{c_2}{a} \right)$

$Z = 2 i_y da \left\{ \operatorname{arctg} \frac{c_2}{a} - \operatorname{arctg} \frac{c_1}{a} \right\}$

$$\underline{(a_2\, a_1)(b_2\, b_1)}$$

$$X = \cancel{*}\, f\sigma\, dc \left\{ \log \frac{a_2^2+c^2}{a_1^2+c^2} \right.$$

$$y = 0$$

$$Z = 2f\sigma\, dc \left\{ \operatorname{arctg} \frac{a_2}{c} - \operatorname{arctg} \frac{a_1}{c} \right\}$$

$$\underline{(a_2 - a_1)(c_2 - c_1)}$$

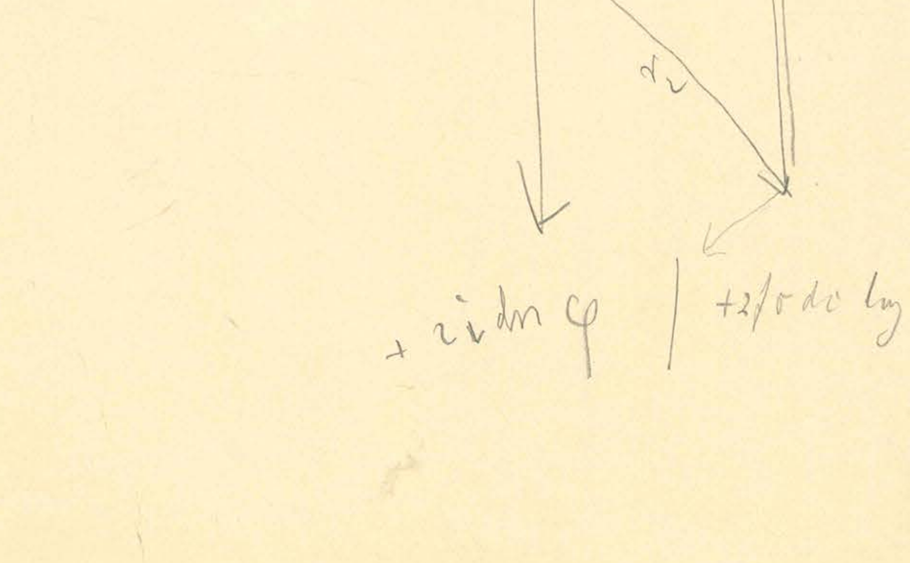
$$X = 0 \quad y = 0 \quad Z = 0.$$

$$\underline{(b_2 - b_1)(c_2 - c_1)}$$

$$X = 2f\sigma\, da \left\{ \operatorname{arctg} \frac{c_2}{a} - \operatorname{arctg} \frac{c_1}{a} \right.$$

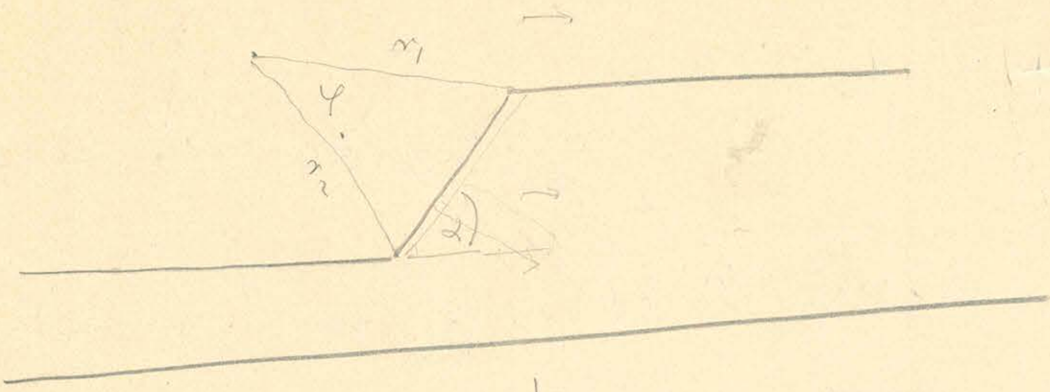
$$y = 0$$

$$Z = f\sigma\, da \log \frac{c_2^2 + a^2}{c_1^2 + a^2}$$



$$\cancel{*}\; 2i \log \frac{r_2}{r_1} \;\Big|\; 2\frac{f\sigma}{} dn\, \varphi$$

$$+ 2i\, dn\, \varphi \;\Big|\; +2f\sigma\, dc \log \frac{r_2}{r_1}$$



X

$-2\sin\alpha\log\frac{r_2}{r_1}\cancel{\sin\alpha} - 2\sin\alpha\cos\alpha\,\varphi$

$2\rho\varphi\sin^2\alpha - 2\rho\sin\alpha\cos\alpha\log\frac{r_2}{r_1}$

$-\sin 2\alpha\log\frac{r_2}{r_1} + 2\sin^2\alpha\,\varphi$

$2\rho\varphi$

$\cancel{\sin\alpha\left(2\varphi\cos\alpha - 2\log\frac{r_2}{r_1}\sin\alpha\right)}$

$\cos\alpha(2\varphi\cos\alpha$

$\cos\alpha\left(2\varphi\cos\alpha - 2\log\frac{r_2}{r_1}\sin\alpha\right)$

$-2\log\frac{r_1}{r_2}$

$\cancel{2\varphi\sin\alpha\cos\alpha + 2\log\frac{r_2}{r_1}\sin^2\alpha}$

Migrenes

$$\frac{\partial X}{\partial z} = \cos\alpha\left(-2\log\frac{r_2}{r_1}\sin\alpha + 2\varphi\cos\alpha\right)$$

$-2\sin + 2\varphi$

$$= -\sin 2\alpha\log\frac{r_2}{r_1} + 2\varphi\sin^2\alpha.$$

$\frac{\partial X}{\partial z}$

$\cos\alpha\left(2\varphi\sin\alpha - 2\log\frac{r_2}{r_1}\cos\alpha\right)$

$+2\log\frac{r_2}{r_1}$

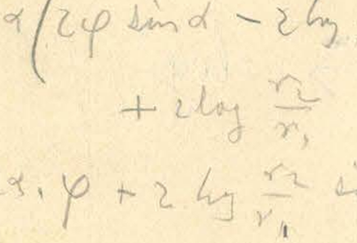
$$\frac{\partial Z}{\partial y} = \sin\alpha\left(-2\log\frac{r_2}{r_1}\cos\alpha + 2\varphi\sin^2\alpha\right)$$

$$\frac{\partial X}{\partial z} = \sin 2\alpha\cdot\varphi + 2\log\frac{r_2}{r_1}\sin^2\alpha.$$

$\frac{\partial Z}{\partial x}$ $\sin\alpha\left(2\varphi\cos\alpha + 2\log\frac{r_2}{r_1}\ \right)$

$\frac{r\,d\varphi}{tg(\varphi-\alpha)} = dr$

$tg(\varphi-\alpha) = \frac{dr}{r\,d\varphi}$



$r\,d\varphi\,tg\,\varepsilon = dr$

$\varepsilon + \beta = \frac{\pi}{2}$

$\alpha = \beta + \varphi$

$\varepsilon + \alpha - \varphi = \frac{\pi}{2}$

$\varepsilon = \frac{\pi}{2} + \varphi - \alpha$

$\frac{\sin\alpha}{\cos\alpha}$

ab · tábl

$X = -i_y \, c \, dc$

$$X = -i_y c\,dc \int_{b_1}^{b_2}\int_{a_1}^{a_2} \frac{da\,db}{r^3} + i_z\,dc \int_{b_1}^{b_2}\int_{a_1}^{a_2} \frac{da\,b\,db}{r^3}$$

$$Y = + i_x c\,dc \iint \frac{da\,db}{r^3} - i_z\,dc \iint \frac{a\,da\,db}{r^3}$$

$$Z = - i_x\,dc \iint \frac{da\,b\,db}{r^3} + i_y\,dc \iint \frac{a\,da\,db}{r^3}$$

$a = a_2^2 + c^2$
$b = 1$
$f = c^2$
$g = 1$
$afg - bf^2 = (a^2+c^2)c^2 - c^4 = a^2c^2$

$$\iint \frac{da\,db}{r^3} = \int_{b_1}^{b_2}\int_{a_1}^{a_2} \frac{a}{(b^2+c^2)\sqrt{a^2+b^2+c^2}}\,db = a_2 \int \frac{db}{(b^2+c^2)\sqrt{a_2^2+b^2+c^2}} - a_1 \int \frac{db}{(b^2+c^2)\sqrt{a_1^2+b^2+c^2}}$$

$\cancel{\iint \frac{da\,b\,db}{r^3}}$ $$\iint \frac{da\,db}{r^3} = \frac{a_2}{a_2 c} \operatorname{arctg} \frac{b\,a\,c}{c^2\sqrt{a^2+b^2+c^2}}$$

$$\iint \frac{da\,db}{r^3} = \int_{b_1}^{b_2} \frac{1}{c} \operatorname{arctg} \frac{a_2 b}{c\sqrt{a_2^2+b^2+c^2}} - \int_{b_1}^{b_2} \frac{1}{c} \operatorname{arctg} \frac{a_1 b}{c\sqrt{a_1^2+b_1^2+c^2}}$$

$$\iint \frac{da\,db}{r^3} = \frac{1}{c}\left\{ \operatorname{arctg} \frac{a_2 b_2}{c\sqrt{a_2^2+b_2^2+c^2}} - \operatorname{arctg} \frac{a_2 b_1}{c\sqrt{a_2^2+b_1^2+c^2}} - \operatorname{arctg} \frac{a_1 b_2}{c\sqrt{a_1^2+b_2^2+c^2}} + \operatorname{arctg} \frac{a_1 b_1}{c\sqrt{a_1^2+b_1^2+c^2}} \right\}$$

$$\iint \frac{da\,b\,db}{r^3} = \int_{b_1}^{b_2}\int_{a_1}^{a_2} \frac{a}{(b^2+c^2)\sqrt{a^2+b^2+c^2}}\,b\,db = a_2 \int_{b_1}^{b_2} \frac{b\,db}{(b^2+c^2)\sqrt{a_2^2+b^2+c^2}} - a_1 \int_{b_1}^{b_2} \frac{b\,db}{(b^2+c^2)\sqrt{a_1^2+b^2+c^2}}$$

$a = a_2^2 + c^2$
$b = 1$
$f = c^2$
$g = 1$
$ag^2 - bfg = a_2^2$

$$a_2 \int_{b_1}^{b_2} \frac{b\,db}{(b^2+c^2)\sqrt{a_2^2+b^2+c^2}} = \int_{b_1}^{b_2} \log \frac{\sqrt{a_2^2+b^2+c^2} - a}{\sqrt{a_2^2+b^2}}$$

$$\iint \frac{da\,b\,db}{r^3} = \log \frac{\sqrt{a_2^2+b_2^2+c^2} - a_2}{\sqrt{a_2^2+b_2^2}} - \log \frac{\sqrt{a_2^2+b_1^2+c^2} - a_2}{a_2^2+b_1^2}$$
$$- \log \frac{\sqrt{a_1^2+b_2^2+c^2} - a_1}{\sqrt{a_1^2+b_2^2}} + \log \frac{\sqrt{a_1^2+b_1^2+c^2} - a_1}{\sqrt{a_1^2+b_1^2}}$$

$a_2 = a \qquad a_1 = 0$

i_x

$X = 0$

$$Y = i_x\, db\, dc\, \frac{c}{b^2+c^2} \Bigg|_{a_1}^{a_2} \frac{a}{\sqrt{a^2+b^2+c^2}} \qquad Y = i_x\, db\, dc\, \frac{c}{b^2+c^2}$$

$$Z = -i_x\, db\, dc\, \frac{b}{b^2+c^2} \Bigg|_{a_1}^{a_2} \frac{a}{\sqrt{a^2+b^2+c^2}} \qquad Z = -i_x\, db\, dc\, \frac{b}{b^2+c^2}$$

$i_y =$

$$X = -i_y\, da\, dc\, \frac{c}{a^2+c^2} \Bigg|_{b_1}^{b_2} \frac{b}{\sqrt{a^2+b^2+c^2}}$$

$Y = 0$

$$Z = i_y\, da\, dc\, \frac{a}{a^2+c^2} \Bigg|_{b_1}^{b_2} \frac{b}{\sqrt{a^2+b^2+c^2}}$$

$i_z =$

$$X = i_z\, db\, da\, \frac{b}{a^2+b^2} \Bigg|_{c_1}^{c_2} \frac{c}{\sqrt{a^2+b^2+c^2}}$$

$$Y = -i_z\, db\, da\, \frac{a}{a^2+b^2} \Bigg|_{c_1}^{c_2} \frac{c}{\sqrt{a^2+b^2+c^2}}$$

$Z = 0.$

$+ \frac{4b^2}{a^3}$

$$\int_{-1}^{+1} \frac{x^2\sqrt{1-x^2}}{c^2+R^2x^2}\,dx =$$

$a=+1 \qquad b=-1$

$f=c^2 \qquad g=R^2$

$$= -\frac{1}{R^2}\int_{-1}^{+1}\frac{x^2dx}{\sqrt{1-x^2}} + \left(\frac{1}{R^2}+\frac{c^2}{R^4}\right)\int_{-1}^{+1}\frac{dx}{\sqrt{1-x^2}} - \left(\frac{c^2}{R^2}+\frac{c^4}{R^4}\right)\int_{-1}^{+1}\frac{dx}{(c^2+R^2x^2)\sqrt{1-x^2}}$$

$$\int_{-1}^{+1}\frac{x^2dx}{\sqrt{1-x^2}} = \Big|_{-1}^{+1} -x + \int_{-1}^{+1}\frac{dx}{\sqrt{1-x^2}} = -2+\pi$$

$$\int_{-1}^{+1}\frac{x^2\sqrt{1-x^2}}{c^2+R^2x^2}\,dx = \frac{2}{R^2} - \cancel{\frac{\pi}{R^2}} + \cancel{\frac{\pi}{R^2}} + \frac{c^2\pi}{R^4} - \frac{c^2}{R^2}\left(\frac{c^2+R^2}{R^2}\right)\frac{\pi}{c\sqrt{R^2+c^2}} =$$

$$= \frac{2}{R^2} + \frac{c^2}{R^4}\pi - \frac{c\sqrt{R^2+c^2}}{R^4}\pi =$$

$$= \frac{2}{R^2} - \frac{\pi c^2}{R^4}\left(\frac{\sqrt{R^2+c^2}}{c} - 1\right)$$

$$\frac{2R}{c}\operatorname{arctg}\frac{R}{c} - 4 + \frac{4c}{R}\operatorname{arctg}\frac{R}{c} = 2\left(\frac{R}{c}+\frac{2c}{R}\right)\operatorname{arctg}\frac{R}{c} - 4$$

$$-\frac{R\pi}{\sqrt{R^2+c^2}}\left(\frac{\sqrt{R^2+c^2}}{c}-1\right) + \frac{4R}{\sqrt{R^2+c^2}} - \frac{2c^2\pi}{R\sqrt{R^2+c^2}}\left(\frac{\sqrt{R^2+c^2}}{c}-1\right)$$

$$-\frac{R\pi}{c} + \frac{R\pi}{\sqrt{R^2+c^2}} + \frac{4R}{\sqrt{R^2+c^2}} - \frac{2c}{R}\pi + \frac{2c^2\pi}{R\sqrt{R^2+c^2}}$$

$$\Bigg[\cancel{-\left(\frac{R}{c}+\frac{2c}{R}\right)\pi} + \frac{c}{\sqrt{R^2+c^2}}\left(\frac{R}{c}+\frac{2c}{R}\right)\pi + \frac{4R}{\sqrt{R^2+c^2}} - 4$$

$$+2\left(\frac{R}{c}+\frac{2c}{R}\right)\cancel{\operatorname{arctg}\frac{R}{c}}\Bigg]\frac{c}{R}\,i$$

$$-\pi \cancel{- \frac{2c^2}{R^2}\pi + \frac{c\pi}{\sqrt{R^2+c^2}} + \frac{2c^2}{R^2}\frac{c\pi}{\sqrt{R^2+c^2}} + \frac{2c}{\sqrt{R^2+c^2}} - \frac{4c}{R}}$$

~~iety~~ 1

$\underline{i\, R\cos\alpha\, d\alpha\, dr \cdot \cos 2\alpha \cdot C}$

$$\rho^2 = R^2 + r^2 + 2Rr\cos\alpha$$

$$\underline{dY = i\, c\, R\cos\alpha\cos 2\alpha\, d\alpha \int \frac{dr}{(R^2+r^2+2Rr\cos\alpha)^{\frac{3}{2}}}}$$

$$\int \frac{2(2r+2R\cos\alpha)}{4R^2-4R^2\cos^2\alpha}\,\frac{1}{\sqrt{R^2+2Rr\cos\alpha+r^2}}$$

$$\frac{1}{R^2\sin^2\alpha} - \frac{R\cos\alpha}{R^3\sin^2\alpha}$$

$$Y = i\,\frac{c}{R}\cos\alpha\cos 2\alpha\, d\alpha\left(\frac{1-\cos\alpha}{\sin^2\alpha}\right)$$

$$Y = i\,\frac{c}{R}\, d\alpha \left(\frac{\cos^3\alpha}{\sin^2\alpha} - \cos\alpha - \frac{\cos^4\alpha}{\sin^2\alpha} + \cos^2\alpha\right) -$$

$$-3\frac{\pi}{2} + \frac{\pi}{2}$$

$$Y = i\,\frac{c}{R}\,\pi\, d\alpha$$

$$+\frac{2c^2}{R^2} - 2\frac{c^4}{R^4} + 1 - \frac{c^2}{R^2}$$

$$\frac{c^2}{R^2} - 2\frac{c^4}{R^4} + 1$$

$$c^2R^2 - 2c^4 + R^4$$

$$\int_{-1}^{+1} \frac{dx}{c^2+R^2x^2} = \Big|_{-1}^{+1} \frac{1}{cR} \operatorname{arctg} x\frac{R}{c} = \frac{2}{cR} \operatorname{arctg} \frac{R}{c}$$

$$\int_{-1}^{+1} \frac{x^2 dx}{c^2+R^2x^2} = \Big|_{-1}^{+1} \frac{x}{R^2} - \frac{c^2}{R^2} \int_{-1}^{+1} \frac{dx}{c^2+R^2x^2} =$$

$$= \frac{2}{R^2} - \frac{2c}{R^3} \operatorname{arctg} \frac{R}{c}$$

$$\frac{2R}{c} \operatorname{arctg} \frac{R}{c} - \frac{4R^2}{R^2} + \frac{4cR^2}{R^3} \operatorname{arctg} \frac{R}{c}$$

$$2\left(\frac{R}{c} + \frac{2c}{R}\right) \operatorname{arctg} \frac{R}{c} - 4$$

$$\int_{-1}^{+1} \frac{\sqrt{1-x^2}\, dx}{c^2+R^2x^2} =$$

$a = +1 \quad b = -1$

$f = c^2 \quad g = R^2$

$$= -\frac{1}{R^2} \int_{-1}^{+1} \frac{dx}{\sqrt{1-x^2}} + \left(1 + \frac{c^2}{R^2}\right) \int_{-1}^{+1} \frac{dx}{(c^2+R^2x^2)\sqrt{1-x^2}}$$

$$\int_{-1}^{+1} \frac{dx}{\sqrt{1-x^2}} = \Big|_{-1}^{+1} \arcsin x = \pi$$

$$\int_{-1}^{+1} \frac{dx}{(c^2+R^2x^2)\sqrt{1-x^2}} = \frac{1}{\sqrt{c^2R^2+c^4}} \Big|_{-1}^{+1} \operatorname{arctg} \frac{x\sqrt{c^2R^2+c^4}}{c^2\sqrt{1-1x^2}} = \frac{1}{c\sqrt{R^2+c^2}} \pi$$

$$\underline{\int_{-1}^{+1} \frac{\sqrt{1-x^2}\, dx}{c^2+R^2x^2}} = -\frac{1}{R^2}\pi + \frac{R^2+c^2}{R^2} \frac{1}{c\sqrt{R^2+c^2}} \pi =$$

$$\underline{= \frac{\pi}{R^2}\left(\frac{\sqrt{R^2+c^2}}{c} - 1\right)}$$

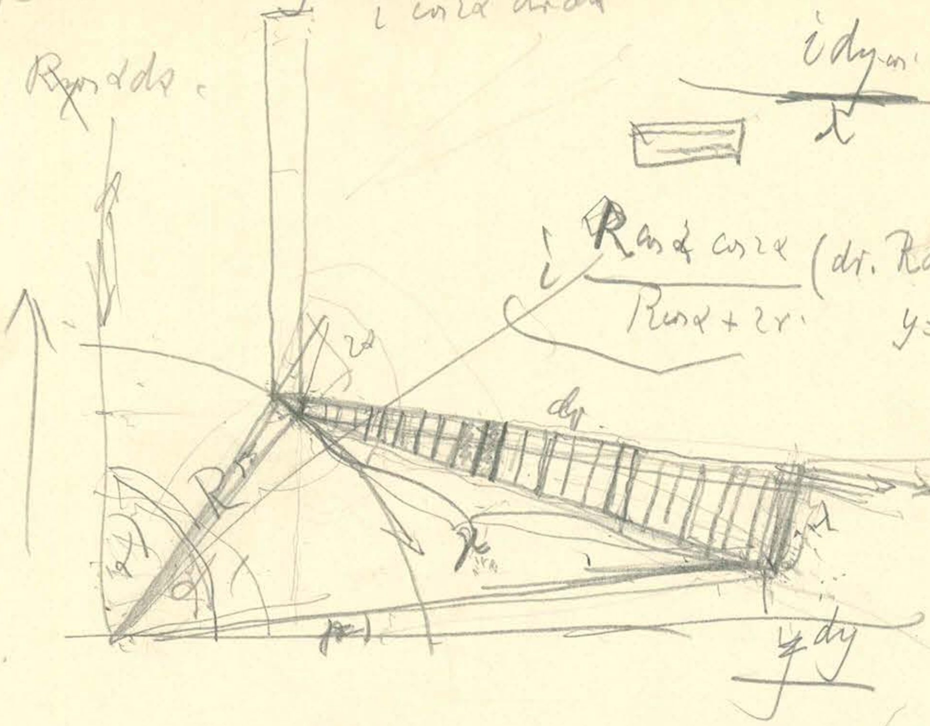
$y = R\sin\alpha$ $\quad i\,dy$ $\quad i\cos 2\alpha\, dr\, d\alpha$

$R\cos\alpha\, d\alpha$

$$\frac{i\,dy}{\lambda} = \frac{i\,dy\cos 2\alpha}{R\,d\alpha\cos\alpha + 2r\,d\alpha}$$

$$i\,\frac{R\cos\alpha\cos 2\alpha}{R\cos\alpha + 2r}\,(dr \cdot R\,d\alpha\cos\alpha + r\,dr\,d\alpha)$$

$y = R\sin\alpha \qquad dy = R\cos\alpha\, d\alpha$



$r = y - R\sin\alpha$

$$i_x = \frac{R\cos\alpha\cos 2\alpha}{R\cos\alpha + 2(y - R\sin\alpha)}$$

$\frac{\pi}{2} + \alpha \qquad \frac{\pi}{2} + 2\alpha$

$$y = \varrho\sin\beta = \frac{\varrho\, d\varrho\, d\beta}{(R^2 + c^2)^{\frac{3}{2}}} \quad \frac{R\cos\alpha\cos 2\alpha}{R\cos\alpha + 2r}$$

~~$y = \varrho\cos\beta$~~

$$\varrho\sin\alpha' = R\sin\alpha + r\sin 2\alpha$$
$$\varrho\cos\alpha' = R\cos\alpha + r\cos 2\alpha$$

$$\varrho^2 = R^2 + r^2 + 2Rr\cos 3\alpha$$

$\operatorname{arctg}\frac{R}{c} - \frac{\pi}{2} = \operatorname{arctg}\frac{c}{R}$ $\qquad dy$

$$\int_{r=0}^{r=\infty} \frac{i\,R\cos\alpha\, d\alpha \cdot dr \cdot \cos 2\alpha \cdot c^2}{(R^2 + r^2 + 2Rr\cos 3\alpha)^{\frac{3}{2}}}$$

$$i\,R\cos\alpha\cos 2\alpha\, d\alpha \int_{r=0}^{r=\infty} \frac{dr}{(R^2 + 2Rr\cos 3\alpha + r^2)^{\frac{3}{2}}}$$

$\operatorname{arctg}\frac{c}{R} = \operatorname{arccotg}\frac{R}{c}$

$$\int \frac{2(2r+2R\cos\alpha)}{4(R^2+c^2)-4R^2\cos^2\alpha}\,\frac{1}{\sqrt{R^2+c^2+2Rr\cos\alpha+r^2}}$$

$$\frac{1}{4(R^2+c^2)-4R}$$

$$\frac{1}{c^2+R^2\sin^2\alpha}-\frac{R\cos\alpha}{(c^2+R^2\sin^2\alpha)\sqrt{R^2+c^2}}$$

$$y=i\frac{c}{R}\left\{\frac{R^2}{c^2+R^2\sin^2\alpha}\cos\alpha\cos2\alpha\,d\alpha-\frac{R}{\sqrt{R^2+c^2}}\frac{\cos^2\alpha\cos2\alpha}{\sin^2\alpha}d\alpha\right\}$$

$$\frac{R^2\cos\alpha\,d\alpha}{c^2+R^2\sin^2\alpha}-2\frac{R^2\sin^2\alpha\cos\alpha\,d\alpha}{c^2+R^2\sin^2\alpha}.$$

$\cancel{\sin^2\alpha = x}$

$\sin\alpha = x$

$\cos\alpha\,d\alpha = dx$

$$\int_{-1}^{+1}\frac{R^2dx}{c^2+R^2x^2}-2\frac{R^2x^2}{c^2+R^2x^2}dx$$

$$R^2\left/\frac{1}{cR}\operatorname{artg}x\frac{R}{c}-2R^2\left(\frac{x}{R^2}-\frac{c^2}{R^2}\frac{1}{cR}\operatorname{artg}x\frac{R}{c}\right)\right.$$

$$2\left(\frac{R}{c}+\frac{2c}{R}\right)\operatorname{artg}\frac{R}{c}-4$$

$$y=i\frac{c}{R}\left[2\left(\frac{R}{c}+\frac{2c}{R}\right)\operatorname{artg}\frac{R}{c}-4,-\pi\frac{R}{\sqrt{R^2+c^2}}\right]$$

$$\frac{c}{R^2}i\left[-2\left(\frac{R}{c}+\frac{2c}{R}\right)\operatorname{arctg}\frac{c}{R}+\frac{R}{\sqrt{R^2+c^2}}\left(\pi+2\frac{c^2}{R^2}\pi+4-4\frac{\sqrt{R^2+c^2}}{R}\right)\right.$$

$$\frac{1}{\sqrt{R^2+c^2}}\left(R\pi+\frac{2c^2}{R}\pi+4R-4\sqrt{R^2+c^2}\right)$$

$$\frac{R}{\sqrt{R^2+c^2}}\left(\pi+\frac{2c^2}{R^2}\pi+4-4\frac{\sqrt{R^2+c^2}}{R}\right)$$

$$\operatorname{arctg}\frac{c}{R}+\operatorname{arctg}\frac{R}{c}\qquad\left(\frac{R^2+2c^2}{R^2}\pi+4\frac{R-\sqrt{R^2+c^2}}{R}\right)$$

$$\frac{c}{\sqrt{R^2+c^2}}i\left\{-\frac{2\left(\frac{R}{c}+\frac{2c}{R}\right)\sqrt{R^2+c^2}\operatorname{arctg}\frac{c}{R}}{R}+\frac{R^2+2c^2}{R^2}\pi+4\frac{R-\sqrt{R^2+c^2}}{R}\right\}$$

$$\frac{c}{\sqrt{R^2+c^2}}i\left\{-\frac{(2R^2+4c^2)\sqrt{R^2+c^2}}{R^2c}\operatorname{arctg}\frac{c}{R}+\frac{R^2+2c^2}{R^2}\pi+4\frac{R-\sqrt{R^2+c^2}}{R}\right\}$$

$$c=r\qquad\operatorname{arctg}\frac{c}{R}\pm\operatorname{arctg}\frac{R}{c}=\frac{\pi}{2}$$

$2\pi\left(1-\frac{1}{\sqrt2}\right)$

$\pi\sqrt2\,(\sqrt2-1)$

$$\frac{1}{\sqrt2}\left\{-6\sqrt2\,\frac{\pi}{4}+3\pi-4(\sqrt2-1)\right\}$$

$\operatorname{arctg}\frac{c}{R}=\frac{\pi}{2}-\operatorname{arctg}\frac{R}{c}$

$-2\operatorname{arctg}\frac{c}{R}=\pi\pm2\operatorname{arctg}\frac{R}{c}$

$\frac{3}{\sqrt2}(\sqrt2-1)\pi$

$\left(\frac{3}{\sqrt2}\pi-4\right)(\sqrt2-1)$

$\left(\frac{3}{2}\pi-2\sqrt2\right)(\sqrt2-1)$

3,1416
1 5708
4,7124
2,8284
1,8840
4142

1,5608

0,7804

$$y = i\frac{c}{R}\left\{\frac{R^2}{c^2+R^2\sin^2\alpha}\cos\alpha\cos2\alpha\,d\alpha - \frac{R^3}{\sqrt{R^2+c^2}}\frac{\cos^2\alpha\cos2\alpha}{c^2+R^2\sin^2\alpha}d\alpha\right\}$$

$$y = i\frac{c}{R}\left[2\left(\frac{R}{c}+\frac{2c}{R}\right)\operatorname{arctg}\frac{R}{c} - 4 - \frac{R^3}{\sqrt{R^2+c^2}}\int\frac{\cos^2\alpha\cos2\alpha}{c^2+R^2\sin^2\alpha}d\alpha\right]$$

$$\cancel{\frac{(1-\sin^2\alpha)(1-2\sin^2\alpha)}{c^2+R^2\sin^2\alpha}d\alpha}. \quad \frac{\sqrt{1-\sin^2\alpha}\,(1-2\sin^2\alpha)\cos\alpha\,d\alpha}{c^2+R^2\sin^2\alpha}$$

$\cancel{\sqrt{1-\sin^2\alpha}}$

$$\int_{-\frac{\pi}{2}}^{+\frac{\pi}{2}}\frac{\cos^2\alpha\cos\alpha}{c^2+R^2\sin^2\alpha}d\alpha = \int_{-1}^{+1}\frac{\sqrt{1-x^2}}{c^2+R^2x^2}dx - 2\int_{-1}^{+1}\frac{x^2\sqrt{1-x^2}}{c^2+R^2x^2}dx$$

$a = 1 \quad b = -1$

$f = c^2 \quad g = R^2$

$$= -2\int\frac{x^2dx}{\sqrt{1-x^2}} - \left(\frac{1}{R^2}+\frac{c^2}{R^4}\right)\int\frac{dx}{\sqrt{1-x^2}} + \left(\frac{c^2}{R^2}-2\frac{c^4}{R^4}+1\right)\int\frac{dx}{(c^2+R^2x^2)\sqrt{1-x^2}}$$

$$-2\operatorname{arctg}\frac{\pi}{2} + 2\operatorname{arctg}\frac{R}{c} = \operatorname{arctg}\frac{\left(\frac{R}{c}-\frac{\pi}{2}\right)}{1+\cancel{R\pi}} = \operatorname{arctg}\frac{\frac{R}{c}-\frac{\pi}{2}}{1+\frac{R\pi}{2c}}$$

$$\frac{}{2c}$$

$\operatorname{arctg}^{\pi}$

$\operatorname{arctg}\cancel{\frac{R}{c}}\;\cancel{\operatorname{arctg}\frac{\pi}{2}}$

$$-2\left(\frac{R}{c}+\frac{2c}{R}\right)\operatorname{arctg}\frac{c}{R}$$

$\pi = 2\operatorname{arctg}(+\infty)\;\cancel{\operatorname{arctg}(-\infty)} = \operatorname{arctg}$

$$\left[\operatorname{arctg}\frac{c}{R}\right]$$

$$\operatorname{arctg}\frac{R}{c} - \operatorname{arctg}\infty = \operatorname{arctg}\frac{\frac{R}{c}-\infty}{1+\frac{R}{c}\infty} \qquad \operatorname{arctg}-\frac{c}{R}$$

$R^2 + \cancel{c}^2 = 56,25 = 225,25$ $\quad \sqrt{R^2+c^2} = \cancel{\ } = 15,01$

56 25 $\quad$ $\cancel{164}$ $\quad$ $R^2 + 20^2 = 394,25$

338

394 25

$$\left(-\frac{788,50 \cdot 15,01}{732,25} \cdot 1,0475 + \frac{394,25}{56,25} \cdot 3,1416 - 4\,\frac{7,51}{7,5}\right)\frac{13}{15,01}$$

0,8567

3 2276

– 4,0053

– 16,9308

– 20,9361

22,0191

+ 1,0830

12397,565

2004

14079

0,9080

+ 1,8760

62802

1,8760

56,25

170

31416

13 / 15 / 1,1538

20

76

65

50

110

9,4072

8881

$\cancel{231}$

0,566

04 3134

7,5 / 130 / 1,733

75

550

525

250

225

2

~~Unterzeichneter~~

Der Unterzeichnete

Als Leiter der im Auftrage der Königl. ungarischen Regierung unternommenen geographischen Arbeiten bestätige ich hiermit, dass Herr Eugen Fekete mit der Ausführung ~~eines Thei~~ eines Theiles dieser Arbeiten betraut ist. Da diese Arbeiten die ~~im freien Felde unternommen~~ Rahmen usw [illegible] unternommen werden nur in der Zeit von Mitte August bis Ende November ausgeführt werden können, ~~wenn~~ würde der Abzug des Genannten zu dieser Zeit das ungestörte Arbeiten der ganzen Expedition gefährden.

B . . .

L. M.- [illegible]

[illegible] . . .

$$\cancel{\frac{a+\sqrt{a^2+n^2}}{n}}$$

$$\frac{n}{a+\sqrt{a^2+n^2}}\left(\frac{1}{\sqrt{a^2+n^2}}-\frac{a+\sqrt{a^2+n^2}}{n^2}\right)$$

$$\cancel{n^2}-a\sqrt{n^2+a^2}-a^2-\cancel{n^2}$$

$$\frac{1}{n\sqrt{a^2-n^2}}-\frac{1}{n\,a^2+b^2+n^2} \quad -an$$

2) $$\frac{1}{n}\left(\frac{1}{\sqrt{a^2+n^2}}-\frac{1}{\sqrt{a^2+b^2+n^2}}\right)$$

$$\frac{1}{n}\left(\frac{1}{\sqrt{a^2+b^2+n^2}}-\frac{1}{\sqrt{a^2+b^2+n^2}}\right)$$

$$\frac{4K}{(11,3)^2}\left(\frac{1}{\sqrt{1+1+1}}-\frac{1}{\sqrt{1+9+1}}\right)$$

Pl.

$$K\left(\frac{n}{a+\sqrt{a^2+n^2}}\left(\frac{1}{\sqrt{a^2+n^2}}-\frac{a+\sqrt{a^2+n^2}}{n^2}\right)-\cancel{\frac{\sqrt{b^2+n^2}}{a+\sqrt{a^2+b^2+n^2}}}\right.\Bigg($$

$$-\frac{\sqrt{b^2+n^2}}{a+\sqrt{a^2+b^2+n^2}}\left(\frac{n}{\sqrt{b^2+n^2}\,\sqrt{a^2+b^2+n^2}}-\frac{(a+\sqrt{a^2+b^2+n^2})\,n}{(b^2+n^2)^{\frac{3}{2}}}\right)$$

$$K\left\{\frac{n}{(a+\sqrt{a^2+n^2})}\frac{(-a\sqrt{a^2+n^2}-a^2)}{n^2\sqrt{a^2+n^2}}-\frac{\sqrt{b^2+n^2}}{a+\sqrt{a^2+b^2+n^2}}\cdot\frac{n(b^2+n^2)-a\sqrt{a^2+b^2+n^2}\,n-n(a^2+b^2+n^2)}{(b^2+n^2)^{\frac{3}{2}}\sqrt{a^2+b^2+n^2}}\right.$$

$$\int_\pi^0\frac{\cos x\,dx}{a-b\cos x}=-\frac{\pi}{b}+\frac{a}{b}\frac{\pi}{\sqrt{a^2-b^2}}$$

$$\int_\pi^0\frac{dx}{a-b\cos x}=\frac{\pi}{\sqrt{a^2-b^2}}$$

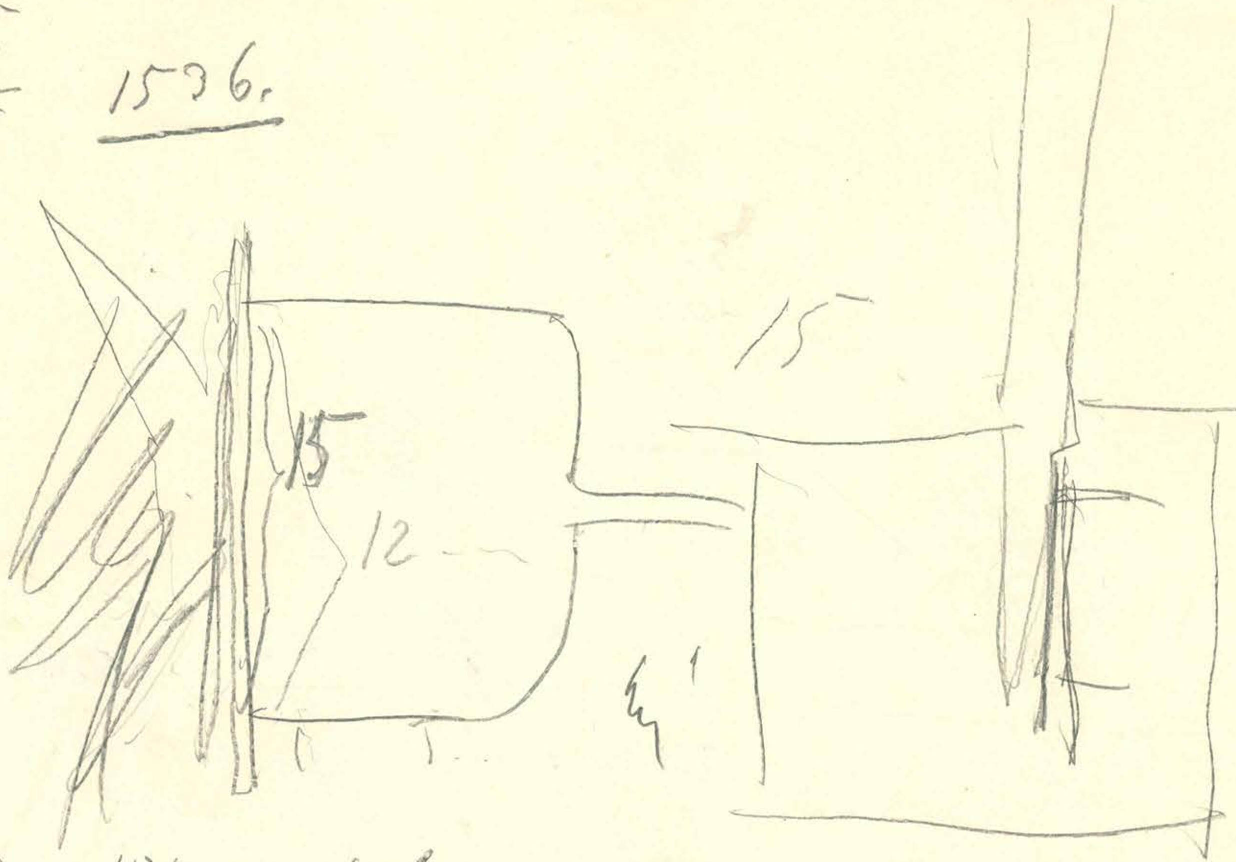
$$\cancel{\frac{\pi}{\cos x}}$$

315
140
175
512

1536.

105
285
490
384

945
420
525



4410
1960
2450

420
1540

8064
3584
4480

7110
2160
3950

2044
1116
2160

2895
1116
1779

315
140

$\frac{18900}{1536}$ $\frac{3150}{256}$ $\frac{1575}{128}$

$\frac{790}{105}$ $\frac{158}{21}$

$\frac{2450}{525}$ $\frac{490}{105}$ $\frac{98}{21}$ $\frac{14}{3}$

122/15

$\frac{593}{175}$

$\frac{244}{30}$ $\frac{468}{300}$ $\frac{156}{100}$

$1.62 \frac{3\pi}{8}$

$\frac{896}{105}$ $\frac{128}{15}$ rad

k. 200

$\frac{7320}{900}$ $\frac{2808}{1000}$ $\frac{39}{25}$ 2 0,1

k. 0,03

$$m_x = \cancel{k}\left(\frac{3x^2}{r^5}M - \frac{M}{r^3}\right) \qquad \frac{\partial Z}{\partial x} = -\frac{3z}{r^5}M + 15\frac{zx^2}{r^7}M$$

$$m_y = \cancel{\lambda}\left(\frac{3xy}{r^5}M\right. \qquad \frac{\partial Z}{\partial y} = \cancel{+15} = +15\frac{xyz}{r^7}M$$

$$m_z = \cancel{k}\frac{3xz}{r^5}M \qquad \frac{\partial Z}{\partial z} = -3\frac{x}{r^5}M + 15\frac{xz^2}{r^7}M$$

$$+\cancel{K}\left(-\frac{9x^2z}{r^{10}} + 45\frac{x^4z}{r^{12}} + \frac{3z}{r^8} - 15\frac{zx^2}{r^{10}}\right)$$

$$\begin{cases} 5{,}0 & 4{,}6 \\ 5{,}3 & 5{,}4 \end{cases}$$

$$\begin{cases} +kzM^2\left(\frac{3}{r^8} - 24\frac{x^2}{r^{10}} + 45\frac{x^4}{r^{12}}\right) \\ +\lambda zM^2 \cdot 45\frac{x^2y^2}{r^{12}} \\ +\mu zM^2\left(-9\frac{x^2}{r^{10}} + 45\frac{x^2z^2}{r^{12}}\right) \end{cases}$$

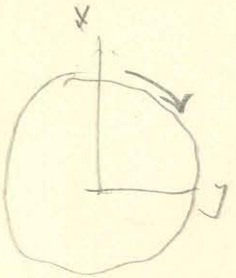
rozkład x úvazujem $k = l \qquad \lambda = \mu = t \qquad x = 0 \qquad y = 0.$

$+\cancel{kzM} \quad zM^2\left(\frac{3l}{r^8}\right.$ [illegible]

rozkład y úvazujem $k = \cancel{t} \qquad \lambda = l \qquad \mu = t$

$\cancel{z}M^2\frac{3t}{r^8}$

Köráram z tengely körül



a b c a köráram egy elemének coordinátái

x y z a vizsgált hely megfelelő coordinátái.

$$X = i \cos\alpha\, \rho\, d\alpha\, \frac{z-c}{r^3}$$

$$Y = i \sin\alpha\, \rho\, d\alpha\, \frac{z-c}{r^3}$$

$$Z = i\, d\alpha\, \frac{\rho^2}{r^3} - i \sin\alpha\, \rho\, d\alpha\, \frac{y}{r^3} - i \cos\alpha\, \rho\, d\alpha\, \frac{x}{r^3}$$

x, y igen kicsiny $\quad a = \rho\cos\alpha \quad b = \rho\sin\alpha$.

$$r^2 = \rho^2 - 2\rho(x\cos\alpha + y\sin\alpha) + (z-c)^2 + x^2 + y^2$$

$$\frac{\partial X}{\partial z} = \left(\frac{\partial X}{\partial z}\right)_0 + \left(\frac{\partial^2 X}{\partial z\,\partial x}\right)_0 x + \left(\frac{\partial^2 X}{\partial z\,\partial y}\right)_0 y + \cancel{\left(\frac{\partial^2 X}{\partial z^2}\right)_0}$$

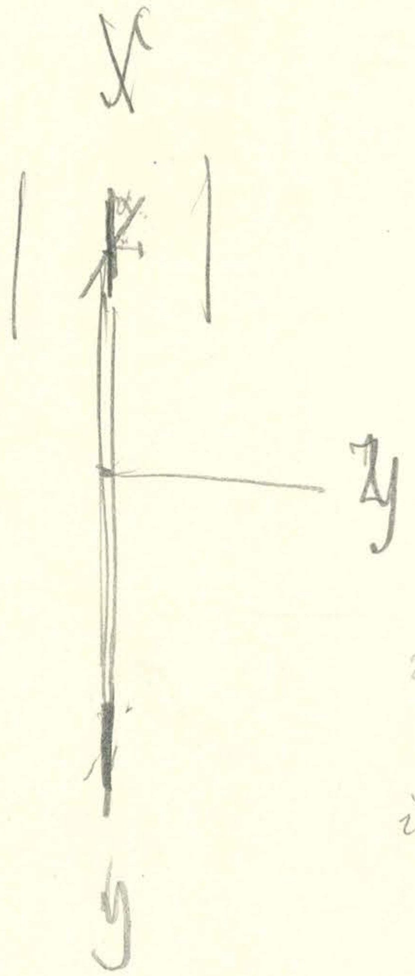
etc.

x és y nak az elsőnél magasabb hatványai elhagy.

$$\frac{\partial X}{\partial z} = i\cos\alpha\,\rho\,d\alpha \left\{ \frac{1}{(\rho^2+(z-c)^2)^{\frac{3}{2}}}\left(1 - 3\frac{(z-c)^2}{\rho^2+(z-c)^2}\right) + 3\frac{\rho\cos\alpha}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\left(1 - 5\frac{(z-c)^2}{\rho^2+(z-c)^2}\right)x \right.$$
$$\left. + 3\frac{\rho\sin\alpha}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\left(1 - 5\frac{(z-c)^2}{\rho^2+(z-c)^2}\right)y \right\}$$

$$\frac{\partial Y}{\partial z} = i\sin\alpha\,\rho\,d\alpha \left\{ \text{előbbi } \frac{\partial X}{\partial z} \text{ zárójele} \right\}$$

$$\frac{\partial Z}{\partial z} = -3 i\, d\alpha\, \frac{\rho^2(z-c)}{(\rho^2+(z-c)^2)^{\frac{5}{2}}} + 3 i\, d\alpha\, \frac{\rho\cos\alpha(z-c)}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\left(1 - 5\frac{\rho^2}{\rho^2+(z-c)^2}\right)x$$
$$+ 3 i\, d\alpha\, \frac{\rho\sin\alpha(z-c)}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\left(1 - 5\frac{\rho^2}{\rho^2+(z-c)^2}\right)y$$



$$m \frac{R^2 C}{(R^2+y^2)^{3/2}} i = H \,tg\, \alpha.$$

$$tg\, \alpha = i \frac{C}{H} \qquad \alpha = \operatorname{arctg} i \frac{C}{H}.$$

$$-i m \alpha \rho\, da \frac{x}{r^3} - i m \alpha \rho\, da \frac{x}{r^3} + i\, da \frac{\rho^2}{r^3}$$

$$2\pi \frac{R^2}{(R^2 + \frac{1}{4}R^2)^{\frac{3}{2}}}$$

$$i \cdot 16\pi \frac{1}{R (5)^{\frac{3}{2}}} = 0{,}14$$

$$\frac{18}{15}\pi$$

$$i \frac{4{,}0}{R} = 0{,}14$$

$$i = 0{,}045\, R.$$

$$\frac{\partial Y}{\partial y} M \sin\alpha + \frac{\partial Y}{\partial x} M \cos\alpha - \tau \alpha.$$

$$\frac{\partial Y}{\partial y} = B + bi \qquad \frac{\partial Y}{\partial x} = A + ai$$

$$MB \sin\alpha + MA \cos\alpha + Mib \sin\alpha + Mia \cos\alpha - \tau\alpha = c.n$$

$$MB \,tg\,\alpha + MA + Mib \,tg\,\alpha + Mia = \frac{cn + \tau\alpha}{\cos\alpha.}$$

$$i\frac{C}{H} B + A + i^2 b \frac{C}{H} + ia = \frac{cn + \tau\alpha}{\cos\alpha}$$

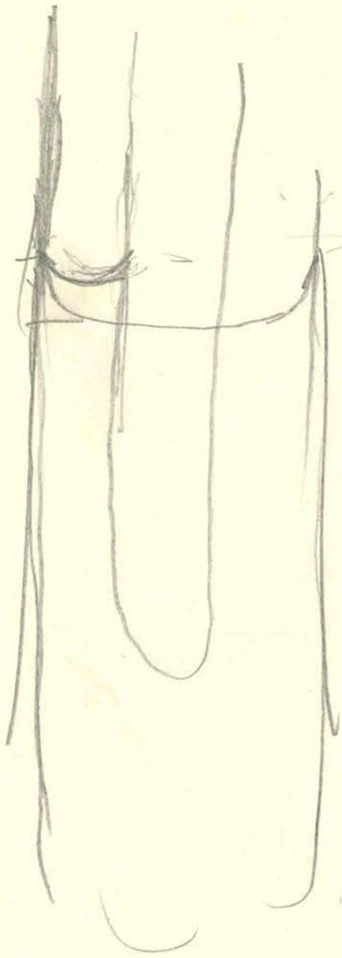
$$- \qquad + \qquad + \qquad - \qquad =$$

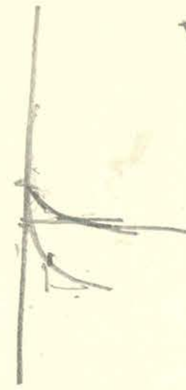
$$2i \frac{C}{H} B + 2ia = \frac{c(n-n') + 2\tau\alpha}{\cos\alpha.}$$

$$2i \frac{C}{H} B - 2ia = -$$

$$B + A\frac{H}{Ci} + ib + a\frac{H}{C} = \frac{cn + \tau\alpha}{\sin\alpha}$$

$$2B + 2a\frac{H}{C} = \frac{c(n+n')}{\sin\alpha.}$$





$$\frac{R^2}{(R^2+x^2)^3}$$

$\frac{1}{R}$ $\frac{1}{8}$

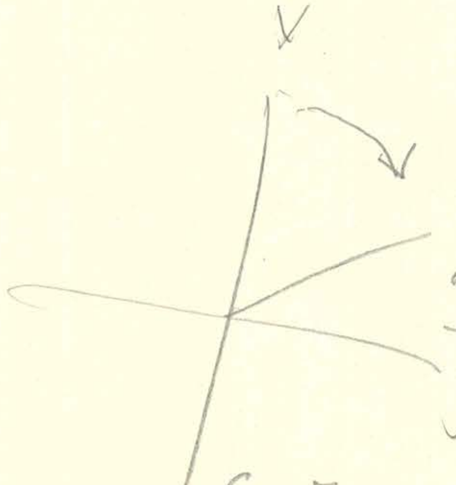
$\frac{2\pi}{8R}$;

$\frac{3\,n}{420}\,i = 0{,}2$

$\frac{3}{80} = 0{,}2$

$n\,i = 5$

50 m $\frac{1}{10}$ [illegible]



$i_x = i \cos\alpha$

$i_y = i \cos\alpha$

$da\,db\,dc = \rho\, d\alpha$.

négyes

$x = \rho\cos\alpha$

$y = \rho\sin\alpha$.

x y végtelen hosszú

x y z végtelen hosszú,

$r^2 = (\rho\cos\alpha - x) + (\rho\sin\alpha - y) + (z-c)^2$

$= \rho^2 + (z-c)^2 - 2\rho(x\cos\alpha + y\sin\alpha) + (x^2+y^2)$

$X = i \sin\alpha\, \rho\, d\alpha\, \frac{z-c}{\rho^2 + 2\rho(x\sin\alpha + y\cos\alpha}$

$$\begin{cases} X = i \cos\alpha\, \rho\, d\alpha\, \frac{z-c}{r^3} \\ Y = i \sin\alpha\, \rho\, d\alpha\, \frac{z-c}{r^3} \\ Z = -i\sin\alpha\, \frac{y-b}{r^3} - i\cos\alpha\, \frac{x-a}{r^3} \end{cases}$$

$$\frac{\partial y}{\partial z} = 3\pi i \frac{\rho}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\left(1-5\frac{(z-c)^2}{\rho^2+(z-c)^2}\right) y$$

$2c$ $\qquad\qquad$ c

$$\frac{\partial y}{\partial z} = 3\pi i \rho^2\left\{\frac{1}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\left(1-5\frac{(z-c)^2}{(\rho^2+(z-c)^2)}\right)+\frac{1}{(\rho^2+(z+c)^2)^{\frac{5}{2}}}\left(1-5\frac{(z+c)^2}{\rho^2+(z-c)^2}\right)\right\} y$$

$$\frac{\partial}{\partial c} \qquad \frac{\partial}{\partial z} \qquad \frac{\partial}{\partial y} \qquad\qquad c^2=\frac{1}{4}\rho^2 \qquad \rho^2=4c^2$$

in

$$5\frac{(z-c)}{(\rho^2+(z-c)^2)^{\frac{7}{2}}}\left(\cancel{} + \frac{10(z-c)}{(\quad)^{\frac{7}{2}}} - \frac{35(z-c)^3}{(\rho^2+(z-c)^2)^{\frac{9}{2}}}\right.$$

$$\left(\frac{\partial\frac{\partial y}{\partial z}}{\partial z}\Delta z + \frac{\partial\frac{\partial y}{\partial z}}{\partial c}\Delta c + \frac{\partial\frac{\partial y}{\partial z}}{\partial y}\Delta y\right) =$$

$$3\pi i\rho^2\left\{\left(+5\frac{1}{5^{\frac{7}{2}}c^6} - 35\frac{1}{5^{\frac{9}{2}}c^6} - 5\frac{1}{5^{\frac{7}{2}}c^6} + 35\frac{1}{5^{\frac{9}{2}}c^6}\right)\right.$$

$$\frac{1}{r^3} - 3\frac{(z-c)^2}{r^5}$$

$$+3\frac{\rho\cos\alpha}{r^5} - 15\frac{(z-c)^2\rho\cos\alpha}{r^7}$$

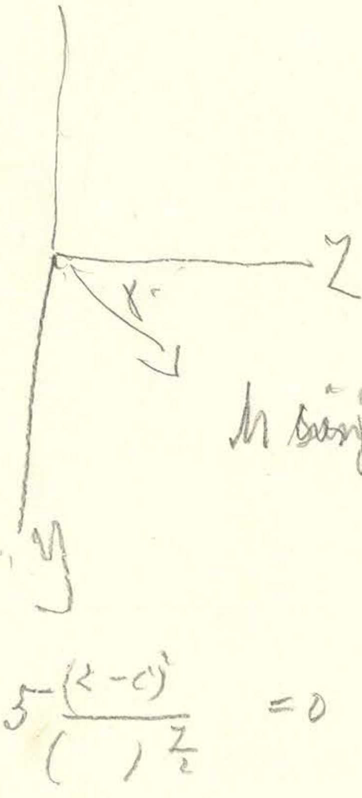
$$\cancel{-3\frac{\rho\cos\alpha(z-c)}{r^5}} \quad -3\frac{(z-c)}{r^5} - \frac{6\,z-c}{r^5} + 15\frac{(z-c)^3}{r^7}$$

$$\frac{\partial Z}{\partial z} = -3\,i\,d\alpha(\rho^2 - \rho\sin\alpha y - \rho\cos\alpha x)\frac{z-c}{r^5}$$

$$+3\,i\,d\alpha\,\frac{\rho\cos\alpha\,(z-c)}{\rho_0^5} - 15\,i\,d\alpha\,\rho^2\frac{z-c}{r_0^7}\rho\cos\alpha$$

$$-3\,i\,d\alpha\,\frac{\rho^2}{\rho_0^5} + 15\,i\,d\alpha\,\frac{\rho^2(z-c)^2}{r^7}$$

$$3\,\frac{\rho\sin\alpha}{r^5}$$



$$Ci = 2l\,tg\,\gamma$$

$$i = \frac{2l}{C}\,tg\,\gamma$$

$$M\sin\gamma\frac{\partial Z}{\partial z} + M\cos\gamma\frac{\partial Z}{\partial y}$$

$$\frac{1}{(\rho^2+(z-c)^2)^{\frac{5}{2}}} - 5\frac{(z-c)^2}{(\quad)^{\frac{7}{2}}} = 0$$

$$\rho^2 - 4(z-c)^2 = 0$$

$$\rho^2 = 2$$

$$i\,3\pi\frac{\rho^2}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\left(1 - 5\frac{(z-c)^2}{(\rho^2+(z-c)^2)}\right)y$$

Köráram hatása Z, X, Y x, y, z irányú összetevői

$$X = i \cos\alpha\, \rho\, d\alpha \frac{z-c}{r^3}$$

$$Y = i \sin\alpha\, \rho\, d\alpha \frac{z-c}{r^3}$$

$$Z = -i \sin\alpha\, \rho\, d\alpha \frac{y-b}{r^3} - i\cos\alpha \frac{x-a}{r^3} = i\, d\alpha \frac{\rho^2}{r^3} - i \sin\alpha\, \rho\, d\alpha \frac{y}{r^3} - i\cos\alpha\, \rho\, d\alpha \frac{x}{r^3}$$

x, y, végtelen kicsiny

$a = \rho\cos\alpha$

$b = \rho\sin\alpha$

$$r^2 = \rho^2 - 2\rho(x\cos\alpha + y\sin\alpha) + (z-c)^2 + (x^2+y^2)$$

x és y második hatványai elhanyagolva.

$$\frac{1}{r^3} = \frac{1}{(\rho^2+(z-c)^2)^{\frac{3}{2}}}\left(1 + \frac{3\rho(x\cos\alpha + y\sin\alpha)}{\rho^2+(z-c)^2} - \frac{3}{2}\frac{x^2+y^2}{\rho^2+(z-c)^2}\right)$$

integrálva α szerint.

$$X = 3\pi i \frac{\rho^2(z-c)}{(\rho^2+(z-c)^2)^{\frac{5}{2}}} \cdot x$$

$$Y = 3\pi i \frac{\rho^2(z-c)}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\, y$$

$$Z = +2\pi i \frac{\rho^2}{(\rho^2+(z-c)^2)^{\frac{3}{2}}}$$

$$\frac{\partial Z}{\partial z} = -6\pi i \frac{\rho^2(z-c)}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}$$

$$\frac{\partial Z}{\partial z} = -\frac{3}{2} Z \cdot \frac{z-c}{\rho^2+(z-c)^2}$$

$$\frac{\partial Z}{\partial z} = +3\pi i \rho^2 \left[\frac{z+c}{(\rho^2+(z+c)^2)^{\frac{5}{2}}} - \frac{z-c}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}\right]$$

$$= 3\pi i \frac{\rho^2}{(\rho^2+z^2)^{\frac{5}{2}}}\left\{(z+c)\left(1 - \frac{5}{2}\frac{2c}{\rho^2}\right) - (z-c)\left(1+5\frac{zc}{\rho^2}\right)\right\}$$

$2c \quad 2z - 10\frac{c^2}{\rho^2}$

$$\frac{\partial Z}{\partial z} = -6\pi i \frac{\rho^2}{(\rho^2+z^2)^{\frac{5}{2}}}\left(1 - 5\frac{c^2}{\rho^2}\right) z$$

$x = 166.$

$\frac{1}{4\pi}\,\frac{\kappa}{m^2}$ $\quad i_x$ ~~8,720~~ 9,818

$z = -48,2$	$\gamma_0 = 128$	$\frac{1}{1-1,964}$	$\frac{1}{0,036} = 27,77$	~~8,220~~
$-27,0$	$\gamma_0 = 100$	$\frac{1}{1-0,54}$	$\frac{1}{0,46} = 2,174$	2,050
$-3,0$	$\gamma = 91^0$	$\frac{1}{1-0,06}$	$\frac{1}{0,94} = 1,064$	1,063
0	$\gamma = 90$	1	$1 = 1$	1
$+3,5$	$\gamma = 89$	$\frac{1}{1,07}$	$\frac{1}{1,07} = 0,935$	0,934
$+40$	$\gamma = 80$	$\frac{1}{1,80}$	— — —	0,530

0,825511 −1
0,476533 −1
1,443576
0,920109

0,993351 −1
0,980053 −1
0,337260
0,317313

0,999934 −1
0,999802 −1
~~0,295127~~
0,026942
0,026744

0,999934 −1
0,999802 −1
0,970812
0,970614 −1

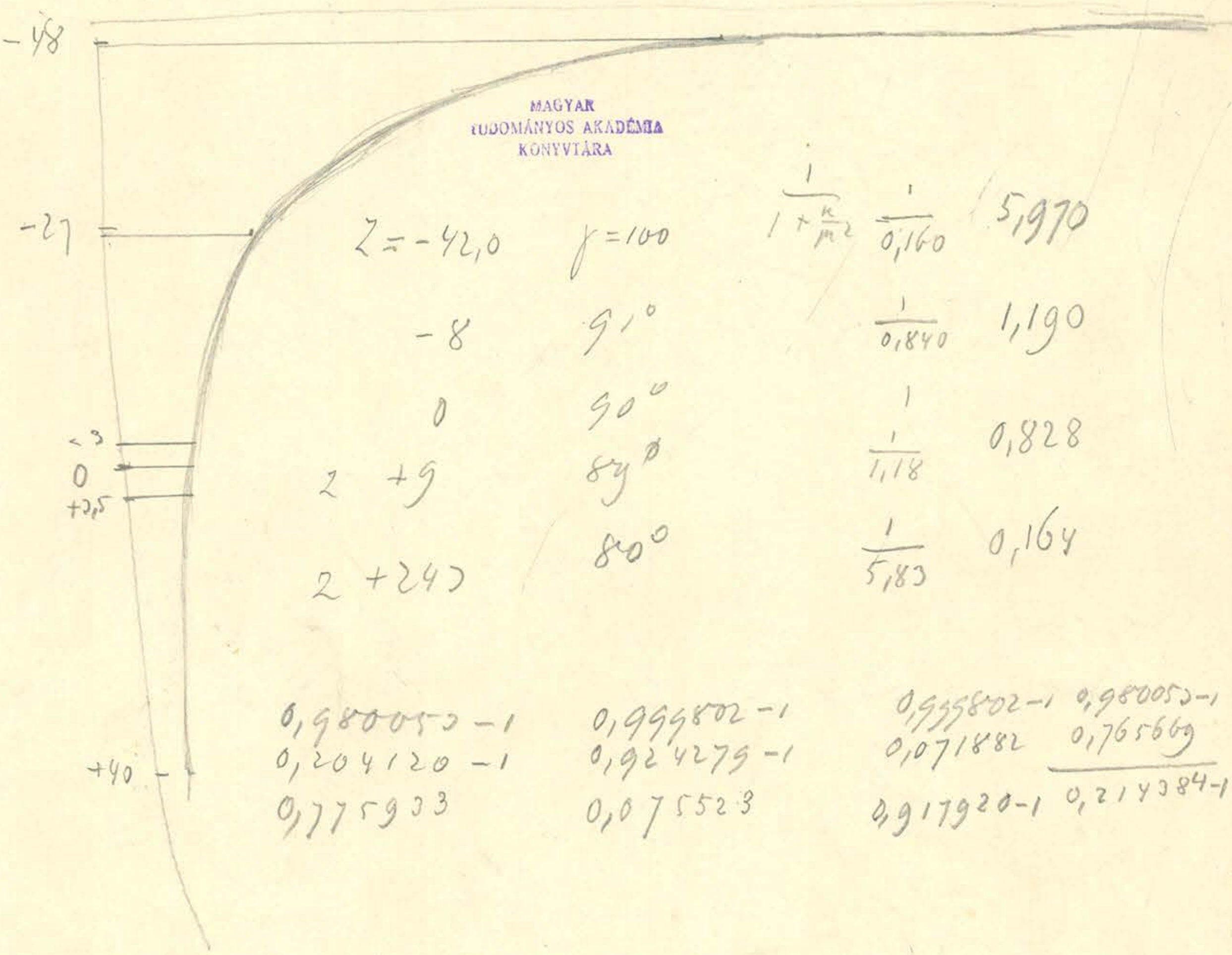
0,849485 −1
0,548455 −1
1,443576
0,992031

0,993357 −1
0,255273
0,738078 −1

0,980053 −1
255273
0,724780

$$i_x = \frac{7}{4\pi}\,\frac{1}{x^2}\left(\frac{x^2}{x^2+z^2}\right)^{\frac{3}{2}} = \frac{7}{4\pi}\,\frac{1}{x^2}\left(\frac{1}{1+\frac{z^2}{x^2}}\right)^{\frac{3}{2}}$$

$$\left(1+\frac{z^2}{x^2}\right)^{\frac{3}{2}}$$



$z = -42,0$	$\gamma = 100$	$\frac{1}{1+\frac{\kappa}{m^2}}$	$\frac{1}{0,160}$	5,970
-8	91^0		$\frac{1}{0,840}$	1,190
0	90^0		1	
$z\ +9$	89^0		$\frac{1}{1,18}$	0,828
$z\ +243$	80^0		$\frac{1}{5,83}$	0,164

0,980053 −1
0,204120 −1
0,775933

0,999802 −1
0,924279 −1
0,075523

0,999802 −1
0,071882
0,917920 −1

0,980053 −1
0,765669
0,214384 −1

$e^{\xi} = 1 + \frac{\xi}{1!} + \frac{\xi^2}{2!} +$

$\mu = \mu_0 e^{kz}$ (with a written above μ_0) $\frac{d\mu}{dz} = ak e^{kz} = k\mu$

$\mu \operatorname{tg} \alpha = \mu_0 \operatorname{tg} \alpha_0 = a \operatorname{tg} \alpha_0$ $\frac{d\mu}{\mu} = k\, dz$

$\frac{dx}{dz} = \operatorname{tg} \alpha = \frac{\operatorname{tg} \alpha_0}{e^{kz}} = e^{-kz} \operatorname{tg} \alpha_0$ $x = -\frac{\operatorname{tg} \alpha_0}{k} e^{-kz} + C$ $h_2 x = 0 \quad z = 0 \quad C = \frac{\operatorname{tg} \alpha_0}{k}$

Normalni górki $\frac{x-\xi}{z-\zeta} = -e^{kz} \frac{1}{\operatorname{tg} \alpha_0}$ . . . . 1) $x - \xi = -e^{kz}(z-\zeta) \frac{1}{\operatorname{tg} \alpha_0}$

$x = \frac{\operatorname{tg} \alpha_0}{k}(1 - e^{-kz})$ . . . 2)

$\xi = \frac{\operatorname{tg} \alpha_0}{k}(1 - e^{-k\zeta})$ . . . . 3)

$x - \xi = \cancel{\frac{\operatorname{tg} \alpha_0}{k}(e^{-k\zeta} - e^{-kz}) = \frac{\operatorname{tg} \alpha_0}{k}(e^{-kz - k(\zeta - z)} - e^{-kz})} = \frac{\operatorname{tg} \alpha_0}{k} e^{-kz}(e^{-k(\zeta - z)} - 1)$

$-e^{kz}(z-\zeta)\frac{1}{\operatorname{tg} \alpha_0} = \cancel{\frac{\operatorname{tg} \alpha_0}{k} e^{-kz}(e^{-k(\zeta - z)} - 1)}$

e^{kz}

$z - \zeta = \cancel{\frac{\operatorname{tg}^2 \alpha_0}{k} e^{-2kz}(1 - e^{-k(\zeta - z)})}$

$xk = \operatorname{tg} \alpha_0 - e^{-kz} \operatorname{tg} \alpha_0$ $\cancel{1 + k(z - \zeta)}$

$\operatorname{tg} \alpha_0 - xk = e^{-kz} \operatorname{tg} \alpha_0$ $\cancel{z - \zeta = \frac{\operatorname{tg}^2 \alpha_0}{} e^{-2kz}(z - \zeta)}$

$\cancel{e^{2kz} = \operatorname{tg}^2 \alpha_0 \quad e^{kz} = \operatorname{tg} \alpha_0}$

$\xi = \frac{1}{k}(\operatorname{tg} \alpha_0 + \Delta \alpha_0)(1 - e^{-kz - k(\zeta - z)}) = \frac{1}{k} \operatorname{tg} \alpha_0 (1 - e^{-kz})$ $\frac{(\operatorname{tg} \alpha_0 - xk)^2 - 1}{\operatorname{tg} \alpha_0 - xk}$

$1 + k(z - \zeta)$

$\xi = \frac{1}{k}\left(\operatorname{tg} \alpha_0 + \frac{\Delta \alpha_0}{\cos^2 \alpha_0}\right)(1 - e^{-kz} e^{+k(z-\zeta)})$

$\xi = \frac{1}{k}\left(\operatorname{tg} \alpha_0 + \frac{\Delta \alpha_0}{\cos^2 \alpha_0}\right)\left((1 - e^{-kz}) - e^{-kz} k(z - \zeta)\right)$

$x - \xi = +\frac{1}{k}\frac{\Delta \alpha_0}{\cos^2 \alpha_0}(1 - e^{-kz}) - e^{-kz} \operatorname{tg} \alpha_0 (z - \zeta) = -e^{kz}(z - \zeta)\frac{1}{\operatorname{tg} \alpha_0}$

$\zeta - z \left(e^{-kz} \operatorname{tg} \alpha_0 - e^{+kz} \frac{1}{\operatorname{tg} \alpha_0}\right) = \frac{\Delta \alpha_0}{\cos^2 \alpha_0}(e^{-kz} - 1) = -k \frac{\Delta \alpha_0 x}{\sin \alpha_0 \cos \alpha_0}$

$(\zeta - z)\left(\operatorname{tg} \alpha_0 - xk - \frac{1}{\operatorname{tg} \alpha_0 - xk}\right) = -k \frac{\Delta \alpha_0}{\sin \alpha_0 \cos \alpha_0} x$

$(\zeta - z)\left(\operatorname{tg} \alpha_0 e^{-kz} - \frac{1}{\operatorname{tg} \alpha_0 e^{-kz}}\right) = -k \frac{\Delta \alpha_0 x}{\sin \alpha_0 \cos \alpha_0}$

$$i_x = \frac{J}{4\pi}\,\frac{\Delta\gamma_0 \sin\gamma_0 \sin^2\gamma}{\Delta z\; x}$$

$$\sin^2\gamma = (1-\sin^2\gamma)\left(\frac{1}{1+\frac{\kappa}{\mu}z}\right)^2 tg^2\gamma_0$$

$$\sin^2\gamma\left(1+\left(\frac{1}{1+\frac{\kappa}{\mu}z}\right)^2 tg^2\gamma_0\right) = \left(\frac{1}{\;\;}\right)^2 tg^2\gamma_0$$

$$i_x = \frac{J}{4\pi}\,\frac{1}{x}\,\frac{\Delta\gamma_0}{\Delta z}\sin\gamma_0\,\frac{tg^2\gamma_0}{(1+\frac{\kappa}{\mu}z)^2+tg^2\gamma_0}$$

$$\cancel{\sin^2\gamma = \frac{tg^2\gamma_0}{(1+\frac{\kappa}{\mu}z)^2+tg^2\gamma_0}}$$

$$\sin^2\gamma = \frac{tg^2\gamma_0}{(1+\frac{\kappa}{\mu}z)^2+tg^2\gamma_0}$$

$$\cancel{i_x = \frac{J}{4\pi}\,\frac{1}{x}\,\frac{\Delta\gamma_0}{\Delta z}\sin\gamma_0}$$

$$i_x = -\frac{J}{4\pi}\,\frac{1}{x}\sin\gamma_0\,\frac{\sin^2\gamma_0}{(1+\frac{\kappa}{\mu}z)^2+tg^2\gamma_0}\;\frac{1}{\frac{\mu}{\kappa}\log\left(1+\frac{\kappa}{\mu}z\right)\left(\frac{1}{1-\frac{\kappa}{\mu}h}\right)^2}\;\frac{\left(tg\gamma_0+(1+\frac{\kappa}{\mu}z)^2\frac{1}{tg\gamma_0}\right)}{\left(1+\frac{\kappa}{\mu}z\right)}$$

$$i_x = -\frac{J}{4\pi}\,\frac{1}{x}\sin^3\gamma_0\,\frac{1}{\frac{\mu}{\kappa}\left[\log\left(1+\frac{\kappa}{\mu}z\right)\left(\frac{1}{1-\frac{\kappa}{\mu}h}\right)^2\right]}\;\frac{1}{\left(1+\frac{\kappa}{\mu}z\right)^2 tg\,\alpha_0}$$

$$i_x = -\frac{J}{4\pi}\,\frac{1}{x}\sin^3\gamma_0\,\frac{1}{\left(1+\frac{\kappa}{\mu}z\right)^2\frac{\mu}{\kappa}tg\,\alpha_0\log\left(1+\frac{\kappa}{\mu}z\right)+\left(1+\frac{\kappa}{\mu}z\right)^2 tg\,\alpha_0\frac{\mu}{\kappa}\log\left(\frac{1}{1-\frac{\kappa}{\mu}h}\right)^2}$$

$$i_x = -\frac{J}{4\pi}\,\frac{1}{x}\,\frac{\sin^3\gamma_0}{\left(1+\frac{\kappa}{\mu}z\right)^2}\;\frac{}{-x+2\frac{\mu}{\kappa}tg\gamma_0\log\left(1-\frac{\kappa}{\mu}h\right)\cancel{+2\frac{\mu}{\kappa}tg\,\alpha_0\log\left(1-\frac{\kappa}{\mu}h\right)}}$$

$$i_x = \frac{J}{4\pi}\,\frac{1}{x^2}\,\frac{\sin^3\gamma_0}{\left(1+\frac{\kappa}{\mu}z\right)}$$

$$\sin^2\gamma_0 = \frac{tg^2\gamma_0}{1+tg^2\gamma_0}$$

$$tg^2\gamma_0 = \frac{\kappa^2}{\mu^2}\,\frac{x^2}{\left[\log\frac{\left(1-\frac{\kappa}{\mu}h\right)^2}{\left(1+\frac{\kappa}{\mu}z\right)}\right]^2}$$

$$\sin^2\gamma_0 = \frac{1}{1+\frac{1}{tg^2\gamma_0}}$$

$$\sin^2\gamma_0 = \frac{1}{1+\left(\frac{\mu}{\kappa}\right)^2\frac{1}{x^2}\left[\log\frac{\left(1-\frac{\kappa}{\mu}h\right)^2}{1+\frac{\kappa}{\mu}z}\right]^2}$$

$$\left[2\log\left(1-\frac{\kappa}{\mu}h\right)-\log\left(1+\frac{\kappa}{\mu}z\right)\right]^2$$

$$-4\log\left(1-\frac{\kappa}{\mu}h\right)\log\left(1+\frac{\kappa}{\mu}z\right)$$

$$+4\left[\log\left(1+\frac{\kappa}{\mu}h\right)\right]^2$$

$$\cancel{\Delta t} =$$

$$\cos^2\gamma_0 = \cancel{\sin^2\gamma}\,\cos^2\gamma_0$$

$$\operatorname{tg}^2\gamma_0 = \frac{1-\cos^2\gamma_0}{\cos^2\gamma_0}$$

$$\cancel{\sin^2\gamma} = \operatorname{tg}^2\gamma = \frac{\sin^2\gamma}{1-\sin^2\gamma}.$$

$$\cos^2\gamma_0 = \frac{1}{1+\operatorname{tg}^2\gamma_0}$$

$$\cos\gamma_0 =$$

$$(1-\sin^2\gamma)\operatorname{tg}^2\gamma = \sin^2\gamma$$

$$\sin^2\gamma = \frac{\operatorname{tg}^2\gamma}{1+\operatorname{tg}^2\gamma} = \frac{\left(\frac{1}{1+\frac{k}{\mu}z}\right)^2\operatorname{tg}^2\gamma_0}{1+(\ )\operatorname{tg}^2\gamma_0}$$

$$\cos^2\gamma_0 =$$

$$\sin^2\gamma = \frac{\operatorname{tg}^2\gamma_0}{(1+\frac{k}{\mu}z)^2+\operatorname{tg}^2\gamma_0}$$

$$\sin\gamma = \frac{1}{\sqrt{1+\left[\frac{\mu+kz}{kx}\log\left(1+\frac{k}{\mu}z\right)\right]^2}}$$

$$\operatorname{tg}^2\gamma_0 = \frac{\left(\frac{k}{\mu}\right)^2x^2}{\left[\log\left(1+\frac{k}{\mu}z\right)\right]^2}\qquad \frac{\mu+kz}{kx}$$

$$\cancel{\frac{1}{\Delta\gamma} = -\frac{\sin\gamma}{\Delta z}}$$

$$\sin^2\gamma = \frac{\left(\frac{k}{\mu}\right)^2x^2}{\left(\log\left(1+\frac{k}{\mu}z\right)\right)^2\left(1+\frac{k}{\mu}z\right)^2+\left(\frac{k}{\mu}\right)^2x^2}$$

$$\sin^2\gamma = \frac{1}{1+\left(\frac{\mu+kz}{kx}\right)^2\left(\log\left(1+\frac{k}{\mu}z\right)\right)^2}$$

$$\Delta\gamma_0\frac{\sin\gamma_0}{\Delta s} = -\frac{\sin\gamma\sin\gamma_0}{\Delta z}\Delta\gamma_0$$

$$\Delta\gamma_0\frac{\sin\gamma_0}{\Delta s} = \frac{k}{\mu}\frac{\cos^2\gamma_0}{\log(1+\frac{k}{\mu}z)}\sin\gamma\sin\gamma_0\left(\frac{1}{1+\frac{k}{\mu}z}\operatorname{tg}\gamma_0+\left(1+\frac{k}{\mu}z\right)\frac{1}{\operatorname{tg}\gamma_0}\right)$$

$$\left(\frac{\mu}{kx}\right)^2\left(\frac{k}{\mu}z\right)^2$$

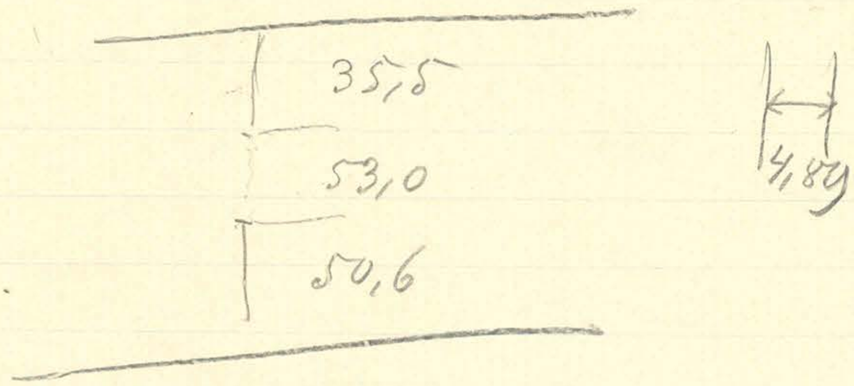
$$\frac{x^2}{x+\frac{z^2}{x^2}}$$

$$\cancel{\operatorname{tg}}\,\gamma_0$$

$$\frac{k}{\mu}\frac{\sin\gamma}{\log(1+\frac{k}{\mu}z)}\left(\frac{1}{1+\frac{k}{\mu}z}\cos\gamma_0\sin^2\gamma_0+\left(1+\frac{k}{\mu}z\right)\cos^2\gamma_0\right)$$

$$\Delta\gamma_0\frac{\sin\gamma_0}{\Delta s} = \frac{k}{\mu}\frac{\sin\gamma\cos\gamma_0}{\log(1+\frac{k}{\mu}z)}\frac{1}{1+\frac{k}{\mu}z}\left[1+\left(2\frac{k}{\mu}z+\left(\frac{k}{\mu}z\right)^2\right)\cos^2\gamma_0\right]$$

258 C. [illegible] a 2081 CGS momentum nyúj 50 C. távolságra ahoz 44. 0.r. egyszerű kitérés.



$k/\mu = 2$ $\quad x = 50 \operatorname{tg} \gamma_0 \log(1+2z) - 50 \operatorname{tg}\gamma_0$ [illegible]

$\gamma_0 = 100°$ $\quad$ 5,6710

[illegible] 2 kz.

$x = 283{,}565 \left(\log(100+2z) + 1306\right)$

z	log 1+2z	log 100+2z		
−2	96	4,5643	1294	12
−4	92	4,5218	1282	24
−6	88	4,4773	1270	36
−8	84	4,4308	1256	50
−10	80	4,3820	1242	63
−15	70	4,2485	1205	101
−20	60	4,0943	1161	145
−25	50	3,9120	1109	197
−30	40	3,6889	1046	260
−35	30	3,4012	964	342
−40	20	2,9957	849	457
~~−45~~	~~10~~	~~2,3026~~	653	
−42	16	2,7726	786	520

63
82
115

$\gamma_0 = 80$

+5	110	4,7005	1333	27
+10	120	4,7875	1358	52
+15	130	4,8675	1380	74
+20	140	4,9416	1401	95
+25	150	5,0106	1421	115
+30	160	5,0752	1439	133
+35	170	5,1358	1456	150
+40	180	5,1930	1473	167
+45	190	5,2470	1488	182
+50	200	5,2983	1502	196
+60	220	5,3936	1529	223
+70	240	5,4806	1554	248
+80	260	5,5607	1577	271
+90	280	5,6348	1598	292
+100	300	5,7038	1617	311
+150	400	5,9915	1699	393
+200	500	6,2146	1762	456
+250	600	6,3969	1814	508
+300	700	6,5511	1858	552

~~$\gamma_0 = 45^\circ$~~ $\gamma_0 = 125^\circ$

$x = 50 \log (1 + 0{,}02z)$

$x = 50 \log 100 - 50 \log (100 + 2z)$

$x = 230{,}26 - 50 \log$

z		log	50 log	
−5	90	4,4998	225,0	5,3
−10	80	4,3820	219,1	11,2
−15	70	4,2485	212,4	17,9
−20	60	4,0943	204,7	25,6
−25	50	3,9120	195,6	34,7
−30	40	3,6889	184,4	45,9
−35	30	3,4012	170,1	60,2
−40	20	2,9957	149,8	80,5
−42	16	2,7726	138,6	91,7
−44	12	2,4849	124,2	106,1
−46	8	2,0794	104,0	126,3
−47	6	1,7918	89,6	140,7
−48	4	1,2863	69,3	161,0
−49	2	0,6931	34,7	195,6
−50			0	

5,9

6,7

z			50 log	
+5	110		235,0	+4,7
+10	120		239,4	9,1
+15	130		243,4	13,1
+20	140		247,1	16,8
+50	200		264,9	34,6
+100	300		285,2	54,9
+150	400		299,6	69,3
+200	500		310,7	80,4
+250	600		319,8	89,5
+300	700		327,6	97,3

$$\frac{\sin \vartheta_0^2}{1+\frac{\kappa}{\mu^2}}.$$

	z	hev.			hev.
$\vartheta_0 = 120°$	$-42,0$	$0,16$			
$95°$	$-12,2$	$0,756$		$-29,0$	$0,420$
$85°$	$+17,3$	$1,346$		$+70,4$	$2,408$
$72°$	$+97,5$	$2,950$			
$60°$	$+291,0$	$5,820$			

$0,937531-1$	$0,998244-1$		$0,978206-1$	
$0,812593-1$	$0,995032-1$	$0,995032-1$	$0,934618-1$	$0,812593-1$
$0,204120-1$	$0,878522-1$	$0,129045$	$0,469822$	$0,764923$
$0,608473$	$0,116510$	$0,865987-1$	$0,464796-1$	$0,047670-1$
~~3,225~~	$1,308$	$0,734$	$0,292$	$0,112$
$4,060$				

$0,995032-1$	$0,995032-1$
$0,623249-1$	$0,381656$
$0,371783$	$0,613376-1$
$2,354$	$0,411$

$\frac{\mu}{\kappa} = 50$ $\qquad \gamma_0 = 170°$ $\qquad x = -50\,tg\,10°\,\log(100+2z) + 50\,tg\,10°\,\log 100$ $\qquad \log 100 = 4,6052$

40,595

$tg\,10° = 0,1763$ $\qquad 50\,tg\,10° = 8,815$

z					398,83		2631,9	
−5	90	4,4998	39,67	0,93	389,72	9,11	2571,8	60,1
−10	80	4,3820	38,61	1,99	379,50	19,33	2504,4	127,5
−15	70	4,2485	37,46	3,14	367,98	30,85	2428,3	203,6
−20	60	4,0943	36,05	4,55	354,56	44,27	23,39,8	292,1
−25	50	3,9120	34,47	6,13	338,80	60,03	2235,7	396,2
−30	40	3,6889	32,53	8,07	319,49	79,34	21083	523,6
−35	30	3,4012	29,97	10,63	294,54	104,29		
−40	20	2,9957	26,45	14,15	259,82	139,01		
−45	10	2,3026	20,27	20,33	199,45	199,38		
−46	8	2,0794	18,34	22,26	180,05	219,78		
−47	6	1,7918	15,78	24,82	155,20	243,63		
−48	4	1,3863	12,25	28,35	120,03	278,80		
−49	2	0,6931	6,08	34,52	60,02	338,81		

10	120	4,79	42,22	1,62
20	140	4,94	43,54	2,94
30	160	5,08	44,78	4,18
40	180	5,19	45,75	5,15
50	200	5,30	46,72	6,12
100	300	5,70	50,25	9,65
150	400	5,99	52,80	12,20
200	500	6,21	54,74	14,14
250	600	6,40	56,42	15,82
300	700	6,55	57,74	17,14

$\frac{u}{\mu} = \frac{1}{50}$ $\vartheta_0 = 120$

$\lg 120 = -1{,}7921$

$x = 86{,}605 \lg (100 + 2z) + 398{,}83$

z	
-5	9,1
-10	19,2
-15	30,9
-20	44,2
-25	60,0
-30	79,3
-35	104,2
-40	139,0
-45	199,4
-46	219,8
-47	242,6
-48	278,8
-49	328,8

72° ~~3,0777~~

~~153,885~~ 708,67

708,7

85° 11,4301

571,51

2631,9

			298,83		708,7			
10	120	4,7875	414,66	15,83	736,8	28,1	2736,4	104,5
20	140	4,9416	428,00	29,17	760,5	51,8	2824,4	192,5
30	160	5,0752	439,52	40,69	781,0	72,3	2900,4	268,5
40	180	5,1930	449,74	50,91	799,1	90,4	2967,9	336,0
50	200	5,2983	458,83	60,00	815,3	106,6	3027,9	396,0
75	250	5,5215	478,15	79,32	849,8	141,1	3155,9	524,0
100	300	5,7038	493,99	95,16	877,8	169,1	3259,9	
150	400	5,9915	518,94	120,11	922,1	213,4	3424,5	
200	500	6,2146	538,25	139,42	956,4	247,7		
250	600	6,3969	554,01	155,28	983,9	275,2		
300	700	6,5511	567,35	168,52	1008,1	299,4		

$$i_x = +\frac{J}{4\pi}\frac{1}{x}\sin\gamma_0 \frac{1+(e^{-kz}\,\mathrm{tg}\,\gamma_0)^2}{\frac{1-e^{-kz}}{k\cos^2\gamma_0}\cdot e^{-kz}\,\mathrm{tg}\,\gamma_0} \cdot \frac{(e^{-kz}\,\mathrm{tg}\,\gamma_0)^2}{1+(e^{-kz}\,\mathrm{tg}\,\gamma_0)^2}$$

$$\mu(z) = \frac{\mu}{\mu_0}$$

$$\sin^2\gamma = \frac{\mathrm{tg}^2\gamma}{1+\mathrm{tg}^2\gamma}$$

$$i_x = +\frac{J}{4\pi}\frac{1}{x}k\frac{e^{-kz}}{(1-e^{-kz})\,\mathrm{tg}\,\gamma_0}\sin^2\gamma_0$$

$$i_x = \frac{J}{4\pi}\frac{1}{x^2}e^{-kz}\sin^2\gamma_0$$

$$\sin^2\gamma =$$

$$\left(\frac{\sin\gamma}{1+\frac{k}{\mu}z}\right)^2 + 1 - \sin^2\gamma_0$$

$$1 - \frac{\frac{k}{\mu}z\left(2+\frac{k}{\mu}z\right)}{\left(1+\frac{k}{\mu}z\right)^2}\sin^2\gamma_0$$

$$1 - \sin^2\gamma\left(1 - \frac{1}{\left(1+\frac{k}{\mu}z\right)^2}\right)$$

$$1 - \frac{\left(1+\frac{k}{\mu}z\right)^2 - 1}{\left(1+\frac{k}{\mu}z\right)^2}\sin^2\gamma_0$$

$$i\sin\gamma = i_x$$

$$i = \frac{i_x}{\sin\gamma}$$

$$\sin^2\gamma_0 = \frac{(e^{-kz}\,\mathrm{tg}\,\gamma_0)^2}{1+(e^{-kz}\,\mathrm{tg}\,\gamma_0)^2}$$

$$e^{-kz}\,\mathrm{tg}\,\gamma_0 = \mathrm{tg}\,\gamma_0 - kx$$

$$\frac{1}{1+\frac{1}{(e^{-kz}\,\mathrm{tg}\,\gamma_0)^2}}$$

$$\mathrm{tg}\,\gamma_0 = \frac{kx}{1-e^{-kz}}$$

$$\frac{1}{1+\left(\frac{1-e^{-kz}}{kx\,e^{-kz}}\right)^2}$$

$$\sin^2\gamma_0 = \frac{1}{1+\frac{1}{k^2x^2}\left(e^{+kz}-1\right)^2}$$

$$\sin^2\gamma$$

$$e^{-2kz}\sin^2\gamma_0 + 1 - \sin^2\gamma_0$$

$$e^{-2kz}\sin^2\gamma_0 + e^{-2kz}\sin^2\gamma_0\frac{1}{k^2x^2}\left(e^{+kz}-1\right)^2$$

$$\operatorname{tg}\alpha_0 = \frac{kx - e^{-kx}}{1 - e^{-kx}} -$$

$$i_x = -\frac{J}{4\pi} \frac{\Delta \cancel{\gamma_0} \sin\gamma_0 \sin^2\alpha}{x(\zeta - z)}$$

$$(\zeta - z)\left(\operatorname{tg}\alpha_0(1 - kz) - \operatorname{cotg}\alpha_0(1 + kz)\right) = -k\frac{\Delta\alpha_0 x}{\sin\alpha_0 \cos\alpha_0}$$

sin t

$$(\zeta - z) = k\frac{\Delta\alpha_0 x}{\cos 2\alpha_0}$$

$\zeta -$

$$\cancel{\frac{1}{k}}\frac{\Delta\alpha_0}{\cos^2\alpha_0}kz - \underbrace{\operatorname{tg}\alpha_0(z - \zeta) + \cancel{\operatorname{tg}\alpha_0(z - \zeta)kz}} = -\frac{z - \zeta}{\operatorname{tg}\alpha_0} \cancel{-(z - \zeta)\frac{1}{\operatorname{tg}\alpha}kz}$$

$$\frac{\Delta\alpha_0}{\cos^2\alpha_0}z - \operatorname{tg}\alpha_0(z - \zeta) = -\frac{z - \zeta}{\operatorname{tg}\alpha_0}$$

$$\frac{\partial \xi_2}{\partial z} =$$

$$\frac{\partial P_2}{\partial t} = 6 k \pi M^2 \frac{d\varrho}{\varrho^6} \left\{ 3 \int \frac{d\xi}{(1+\xi^2)^6} + 18 \int \frac{\xi^2 d\xi}{(1+\xi^2)^6} - 50 \int \frac{\xi^4 d\xi}{(1+\xi^2)^6} \right\}$$

$$3 + 18 \xi^2 + 5 \xi^4$$

$$-12 \frac{x^2}{(\varrho^2+x^2)^5} - 3 \frac{1}{(\varrho^2+x^2)^4} + 120 \frac{z^2 x^2}{(\varrho^2+x^2)^6} + 24 \frac{z^2}{(\varrho^2+x^2)^5}$$

~~$k d\nu M^2$~~ $($

$$\pi k \varrho d\varrho \, dx \, M^2 \left(-24 \frac{x^2}{(\varrho^2+x^2)^5} - 6 \frac{1}{(\varrho^2+x^2)^4} + 120 \frac{\varrho^2 x^2}{(\varrho^2+x^2)^6} + 24 \frac{\varrho^2}{(\varrho^2+x^2)^5} \right)$$

$$\cancel{-24\varrho^2 x^2} \; \cancel{-24 x^4} \; \cancel{-6\varrho^4} \; \cancel{-6x^4} - 12\varrho^2 x^2$$

$$+120 \varrho^2 x^2$$

$$\cancel{+24 \varrho^2 x^2} \; \cancel{+24 \varrho^4}$$

$$+18\varrho^4 - 30x^4 + 108 \varrho^2 x^2$$

$$\left\{ 15 \int \frac{d\xi}{(1+\xi^2)^6} - 6 \int \frac{d\xi}{(1+\xi^2)^6} - 6 \int \frac{\xi^2 d\xi}{(1+\xi^2)^6} \right\}$$

$$+9 \int \frac{d\xi}{(1+\xi^2)^6} - 6 \int \frac{\xi^2 d\xi}{(1+\xi^2)^6}$$

$$0{,}2 \; 10^{-6} = k \cdot 162 \, \frac{3}{8} \pi \left(\frac{1}{256} - \frac{1}{6561} \right)$$

$$= 200\, k \begin{pmatrix} 0{,}003906 \\ 000152 \\ \hline 0{,}003754 \end{pmatrix}$$

$$= 0{,}75\, k \qquad 750$$

$k = 0{,}26$ $\qquad$ $0{,}026$

$4 \; 16$

$$\frac{d_2}{25} = \frac{1\,1}{4\,24}$$

$$36\kappa M^2\pi dx \left\{ \frac{5}{2}\left(-\frac{\rho^4}{6} - \frac{x^2\rho^2}{12} - \frac{x^4}{60}\right)\frac{1}{(\rho^2+x^2)^5} + \left(\frac{\rho^2}{6} + \frac{x^2}{24}\right)\frac{1}{(\rho^2+x^2)^4} \right\}$$

$$\frac{1}{24}\left\{ \begin{array}{l} 4\rho^4 + 4\rho^2x^2 + \cancel{\rho^2x^2 + x^4} \\ -10\rho^4 - 5\rho^2 \cancel{x^2} - \cancel{x^4} \end{array} \right. \qquad -\frac{1}{4}\left. \frac{\rho^4}{(\rho^2+x^2)^5} \right|_{\rho=\rho_1}^{\rho=\rho_2}$$

$$-9\pi\kappa M^2 dx \left/ \frac{\rho^4}{(\rho^2+x^2)^5} \right.$$

$190 \mid 0{,}0625 \mid 0{,}000\,\frac{330}{291}$

$\frac{570}{850}$

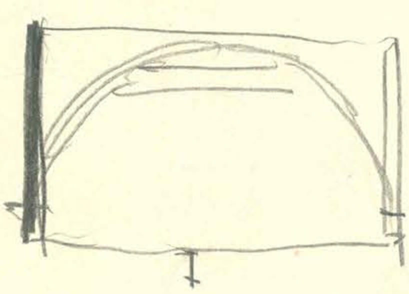
1 mm. 22

8 mm.

1 mm. 2,7 U.r.

$\frac{1}{4}$ h.

$\frac{1}{8}$ mm.



$$\frac{53^2-2200^2}{(53^2+2200^2)^2}\left|\frac{1500}{\sqrt{7092809}}-\frac{500}{\sqrt{5092809}}\right|-\frac{2200^2}{53^2+2200^2}\left|\frac{1500}{(7)^{\frac{1}{2}}}-\frac{1500}{(5)^{\frac{1}{2}}}\right.$$

6,684593
3,176091
9,860684
16,795606
0,065078 − 7

13,370196
3425410

6,684593
2,698970
9,383563
16,723675
0,659888 − 8

13,370196
3,353479

0,11617
0,045092
− 0,07047
3588
− 0,10635

~~3,17691~~
3,176091
6,684845
9,860936
16961328
0,899608 − 8

6,685098
10,276230
16961328

6,684845
2,698970
9,383815
16745535
0,638280 − 8

6,685098
10,060437
16,745535

0,079361
0,043479
− 0,035882

$$1500\left(\frac{1}{(2250009)^{\frac{1}{2}}}-\frac{1}{(2252809)^{\frac{1}{2}}}\right)$$

&66 10
40
2640,300
792000
8
10000

6,352185
3,176090
9,528279
3,176091
0,647812 − 7

6,352725
0,176360
9,529089
3,176091
0,647002 − 7

1673

0,44443
0,44361
0,00082

+ 0,0192 − 0,0116
075

− 0,2890
66
− 0,2956
401
− 0,2555

+ 0,0064
+ 0,0036

2247191

$$+\frac{2250000-2809}{(2250000+2809)^2}\;\frac{2200}{\sqrt{7092809}}+\frac{2250000}{2252809}\;\frac{2200}{(7092809)^{\frac{3}{2}}}$$

484

709

log 7092809 = 6,850819   log √ = 3,425410   log ( )$^{\frac{3}{2}}$ = 10,276230

12,705450
3,425410
16,130860
9,694063
0,563203 −7

6,351640
3,342420

6,352725
10,276230
16,628955
9,694606
0,065651 −7

~~3,425410~~
3,342423
6,352187
9694606

0,36576
0,11632
0,48208

0,36576
1,1

6,351640
12,705450
0,646190 −7
44278

$$+\;1500\left(\frac{1}{(2252809)^{\frac{3}{2}}}-\frac{1}{(7092809)^{\frac{3}{2}}}\right)$$

1500

+0,0265
36
70
471

−0,2956
4,69
3485

3,176363
3,176091
9,529089
0,647002 −7
0,44361
7941
0,3642

3,176091
10,276230
0,899861 −8
0,079408

8,9994
4444

$$-\;2200\left(\frac{1}{(5092809)^{\frac{3}{2}}}-\frac{1}{(7092\ldots)^{\frac{3}{2}}}\right)$$

3,242420
10,060407
0,281986 −7
0,19142
0,11647
0,07495

3,342420
10,276230
0,066193 −7

+0,0192   − 0,0117
75

−0,2955
1
0,2956
469
0,2487

+0,0265
0,0004
70

$$\frac{1500}{(1500^2+5^2)^{\frac{3}{2}}}-\frac{500}{1500^2+5^2}$$

2250025

2250025

6,352188
3,176094
9,528282
3,170091
0,647809 −7

0,601994 −6

5,397984
2,698992
18,096976
2,6959720

$$2200\left(\frac{1}{(1500^2+2200^2+5^2)^{\frac{3}{2}}}-\frac{1}{500^2+2200^2+5^2)}\right)$$

4840 000
250   25
by 5090 025 = 6,706720
$\sqrt{\ }$ = 3,353360
$(\ )^{\frac{3}{2}}$ = 10,060080

2250
4

10,275969	10,060080
3 342423	3,342420
0,066454-7	0,282343 -7

0,1915
0,1165
0,0750

$$-\frac{1}{2250025}\left(\frac{1500}{\sqrt{1500^2+2200^2+5^2}}-\frac{500}{\sqrt{500^2+2200^2+5^2}}\right)-\left(\frac{1500}{(\ )^{\frac{3}{2}}}-\frac{500}{(\ )^{\frac{3}{2}}}\right)$$

4840025

3,425323	3,353360	−0,07060
6,352189	6,352189	3591
9,777512	9,705549	10651
3,176091	2,698970	
0,398579-7	0,992421 -8	

0,25037	3,176091	2,698970
0,09850	10,275969	10,060080
−0,15187	0,900122-8	0,638890-8
(3591)		
−0,118036		

0,079455
0,043540
0,035915

2

$$1500\left(\frac{1}{(1500^2+5^2)^{\frac{3}{2}}}-\frac{1}{(500^2+5^2)^{\frac{3}{2}}}\right)$$

$\frac{1}{(2250025)^{\frac{3}{2}}}$	$\frac{1}{(2250025)^{\frac{3}{2}}}$
6,352766	6,352188
3,176283	3,176094
9,529149	9,528282
3,176091	3,176091
0,646942-7	0,647805 -7
0,44255	0,44444
	44355

2250005
3025

$$\frac{1500}{(2253025)^{\frac{3}{2}}} - \frac{500}{253025}$$

6,352766	5,403164
3,176383	2,701582
9,529149	8,104746
3,176091	2,698970
0,646942-7	0,594224-6

3,9285
4435
3,4850

$$\frac{1500}{(1500^2+3^2)^{\frac{3}{2}}} - \frac{500}{(500^2+3^2)^{\frac{3}{2}}}$$

$$\left(\frac{\partial z}{\partial y}\right)_0 = \left(\frac{\partial z}{\partial y}\right)_4 + \left(\frac{\partial z}{\partial y}\right)_6$$

2250009 250009

6,352185 5,397955

$$\left(\frac{\partial z}{\partial y}\right)_4 + \left(\frac{\partial z}{\partial y}\right)_6 = \left(\frac{\partial y}{\partial z}\right)_0$$

3,176093 2,698978
9,528279 8,096934
3,176091 2,698970
0,647812 − 7 0,602036 − 6

3,9998
4444
0,5554

$$\frac{1}{2250025} \quad \frac{2200}{(2200^2+1500^2+25} + \frac{2200}{(\quad)^{\frac{3}{2}}}$$

~~4840000~~
2250025
7090025

log 7090025 = 6,850646 log V = 3,425323 lg() $\frac{3}{2}$ 10,275969

6,352189
3,425323
9,777512
3,342420
0,5649~~01~~ − 7

10,275969
3,342420
0,066454 − 7.

0,64781.1 − 7.

0,36720
11653
0,~~25068~~
48374

0,444

$$1500\left(\frac{1}{(1500^2+5^2)^{\frac{3}{2}}} - \frac{1}{(1500^2+2200^2+5^2)^{\frac{3}{2}}}\right)$$

3176095
9,528285
3,176091
0,647806 − 7

10,275969
3176091
0,900122 − 8

0,44444
0,07945
0,36499

$$\frac{\overline{53}^2 - \overline{2200}^2}{\left(\overline{53}^2 + \overline{2200}^2\right)^2}\left\{\frac{332}{\sqrt{\overline{166}^2+\overline{2200}^2+\overline{53}^2}} - \frac{\overline{2200}^2}{\overline{2200}^2+\overline{53}^2}\left\{\frac{332}{(\ )^{\frac{3}{2}}}\right.\right.$$

$$-\frac{4{,}837191}{(4{,}842809)^2}$$

13,370196
3,343781
16,713977

6,685098
10,031343
16,716441

6,684593
2,521128
9,205731
16,713977
0,491754 −8
0,00179
− 0,03103
2087
5190

6,684845
2,521128
9,205983
16,716441
0,489542 −8

3,448552
2,521138
5,969690
16,716441
0,253149 −9

− 0,02087

0,2924

$$+\frac{2200}{\left(\overline{500}^2+\overline{2200}^2+\overline{53}^2\right)^{\frac{3}{2}}} - \frac{26600}{\left(\overline{166}^2+\overline{2200}^2+\overline{53}^2\right)^{\frac{3}{2}}}$$

3 242420
10,060407
0,281986 −7
0,19142

3 242427
10,031343
0,311080 −7
0,20468
19142
0,01326

$$-\frac{4{,}837191}{(4{,}842809)^2}\left(\frac{500}{\sqrt{\overline{500}^2+\overline{2200}^2+\overline{53}^2}} - \frac{166}{\sqrt{\overline{166}^2+2200+\overline{53}^2}}\right) - \frac{\overline{2200}^2}{\overline{2200}^2+\overline{53}^2}\left\{\frac{500}{(\ )^{\frac{3}{2}}} - \frac{166}{(\ )^{\frac{3}{2}}}\right\}$$

6,684593
13,370196
0,3314397 −7

2,698970
3,350479
0,345491 −1
3 314397 −7
0,659888 −8

2,220108
3,343781
0,876327 −2
0,314397 −7
0,190724 −8

6,684845
6,685098
0,999747 −1

0,045697
0,01551
0,03018

2,698970
10,060407
0,638533 −8
999747
0,638280 −8

2,220108
10,031343
0,188765 −8
999747
0,188512 −8

0,043479
0,015435
0,028044

$$-166\left(\frac{1}{(166^2+3^2)^{\frac{3}{2}}}-\frac{1}{(166^2+53^2)^{\frac{3}{2}}}\right)$$

27565 30365

4,440358 4,482372

2,220179 2,241187

2,220108 2,220108

6,660537 6,720561

0,559571 − 5 0,496547 − 5

36,2729

31,3724

4,8995

− 0,4900

− 250009 252809

5,397955 5,402792

2,698978 2,701396

2,698970 2,698970

8,096934 8,104188

0,602036 − 6 0,594782 − 6

+205

192

0,3,9998

3,9335

0,0663

$$\frac{\partial z}{\partial x}=\frac{500^2-5^2}{(500^2+5^2)^2} \qquad \frac{\partial x}{\partial z}=\frac{\partial z}{\partial x} \qquad \frac{\partial z}{\partial y}=+\frac{500}{(500^2+5^2)^{\frac{3}{2}}}$$

+ 6,2714

9833

1,2547

− 3,1257 +0,2890

4900 28

66

− 3,6257

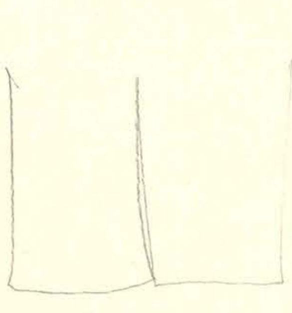
3984

− 3,2273

+205 + 0,0205

− 0,0192

− 0013



+ 0,0295
– 792

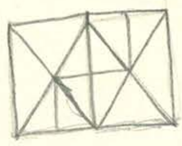
3
27556
3025
30581 + 2,6225 70
+ 0,3955
+ 0,0028
+ 0,5201

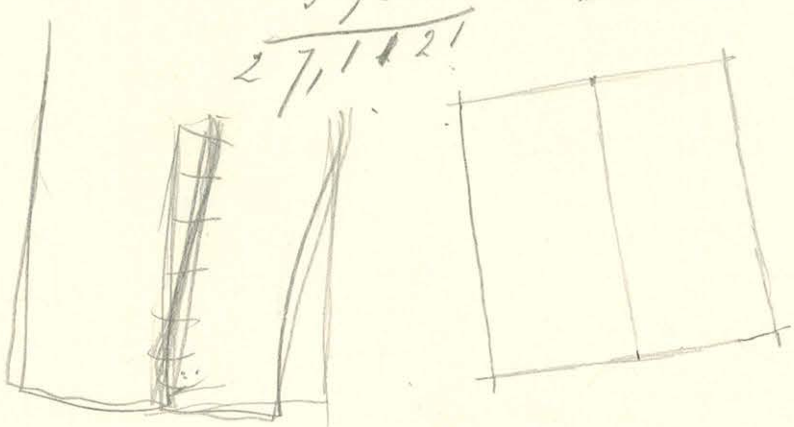
0,6295
0,9184
– 2,7111 összeg

$$\left(\frac{500}{(253025)^{\frac{3}{2}}} - \frac{166}{(30581)^{\frac{3}{2}}}\right)$$

5,402164 4,485452
2,701582 2,242726
8,104746 6,728178
2,698970 2,220108
0,594224-6 0,491930-5

31,0406
3,9285
27,1121





$$+\frac{166^2-53^2}{(166^2+53^2)^2}\frac{2200}{\sqrt{2200^2+166^2+53^2}}+\frac{166^2}{166^2+53^2}\frac{2200}{(2200^2+166^2+53^2)^{\frac{3}{2}}}$$

2200^2 4840000
$166^2 = 27556$
$53^2 = 2809$
4870365

$\log(2200^2+166^2+53^2) = 6{,}687562$ (4870365) $\quad \log\sqrt{\ } = 3{,}343781 \quad \log(\ )^{\frac{3}{2}} = 10{,}031343$

log 24747 = 4,393523
log 2200 = 3,342423
7,735946
12,308527
0,427419 −5

log 166^2 = 4,440216
3,342423
7,782639

3,448552
3,342423
6,790975
14,512716
0,277259 −8

log 30265 = 4,480373
2 log " = 8,964746
3,343781

4,480373
10,031343
14,512716
0,268923 −7

0,0189
+26,7559
0,1857
26,9416
26,8397

26,7370
2,6840

4,393523
8,964746
0,428777 −5

$$\frac{+166}{(\ )^{\frac{3}{2}}}-\frac{166}{(166^2+53^2)^{\frac{3}{2}}}$$

10,031343
2,220108
0,188765 −8

2,241187
6,720561
2,220108
0,496547 −5

31,3724
00,0154
31,3570

$$\frac{247191}{(252809)^2}\frac{2200}{\sqrt{5092809}}+\frac{250000}{252809}\frac{2200}{(\ )^{\frac{3}{2}}}$$

$2200^2 = 4840000$
$500^2 = 250000$
$53^2 = 2809$

$\log 5092809 = 6{,}706958 \quad \log\sqrt{\ } = 3{,}353479 \quad \log(\ )^{\frac{3}{2}} = 10{,}060437$ 5092809

~~5,650492~~
5,393031
3,342423
8,735454

10,805584
3,353479
14,159073

0,576381 −6
0,0021
3,7704
0,1893
3,9597

2,701396
5,402792
10,060437
15,463229

5,397940
3,342423
8,740363
15,463229
0,277134 −7

5,393031
10,805584
0,587447 −6

3,7683

$$+\frac{500}{(500^2+53^2)^{\frac{3}{2}}}-\frac{500}{(\ )^{\frac{3}{2}}}$$

8,104188
2,698970
0,594782 −6

10,060437
2,698970
0,638533 −8

3,9335
0,0435
3,8900

38676
0,3868

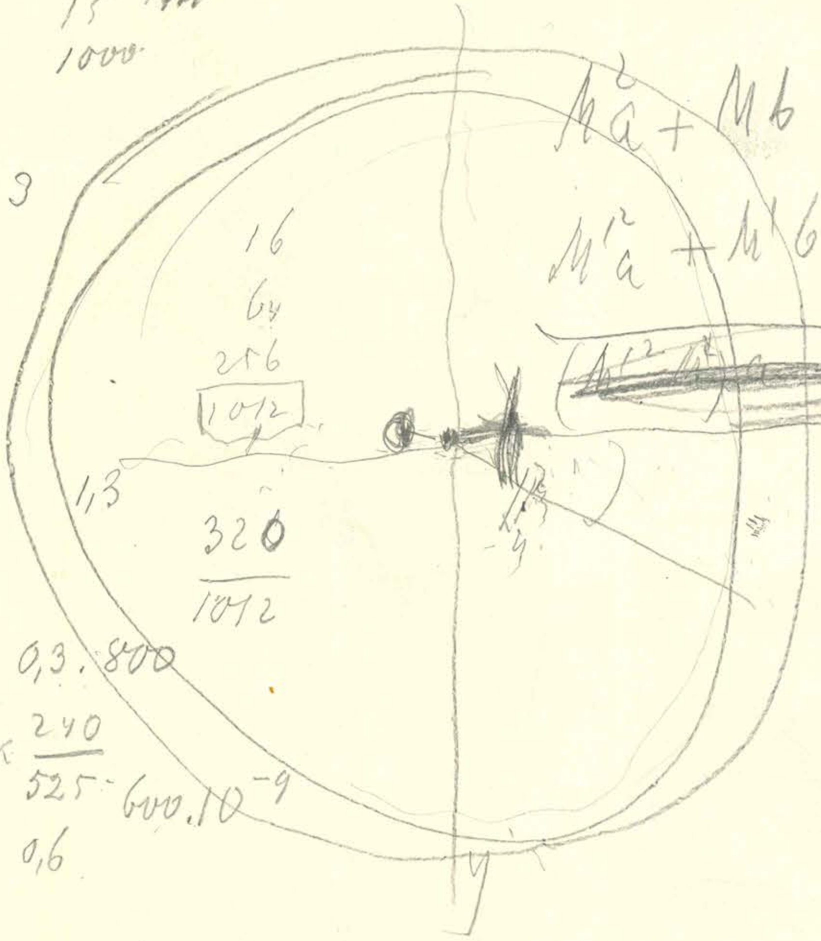
3,448552
3,342423
6,790975
15,463229
~~2,254204~~
0,327746 −9

$2 + \frac{112}{3} + \frac{\overset{118}{256}}{3}$ 2/274

$4, + \frac{896}{3} + \frac{\overset{908}{8192}}{\cancel{1024}}{3}$ /9100

$\frac{2,4 \quad 6\,300}{15 \quad \cancel{1024}}$
1000

$\frac{1,3 \cdot 70 \cdot 160 \; 0,15}{112\,000} \; 10^{-6}$



$M a^2 + M b + G r$

$M'^2 a + M' b + G r'$

$\cancel{(M'^2 - M^2) a + (M' - M) b} + G r'$

9

16
64
256
$\boxed{1012}$

1,3

$\frac{320}{1012}$

$\frac{0}{2}\,0,17$

176

$1,2 \cdot 10^{-6}$

$\frac{1200 \cdot 10^{-9}}{66}$

$\frac{2200 \cdot 10^{-6}}{1838}$ ‖ 17

$\frac{2200 \cdot 10^{-6}}{15625}$ ‖ 2

K 0,3 . 800

$K \frac{240}{525}$ $600 \cdot 10^{-9}$

0,6

0,140

$\frac{140}{66}$

$f(x, y) + A \sin \alpha$

314
942

$X_0 + a\xi + b\eta$

60
15,12

$X_0 + A \sin \alpha + B \cos \alpha + a\xi + b\eta$

2,4.
6,3

300 000

$X_0 + a\xi + b\eta$

$\frac{4,0.\nu.}{10.\nu.}$

650

50.ν.

4 1
1,6 2
64 3
~~128~~ 256 4
~~128~~ 1024

$\frac{162 \quad 1,33 \; 0,3 \,.\, 4,7}{0,4}$

$\frac{305}{1024}$ $0,3\,10^{-6}$

~~300 10^9~~

1,3

20

$\frac{1}{256} - \frac{1}{59049}$

5 31,4 $\frac{600\,000}{}$ 10

$\frac{6}{100}$

$K M \frac{3}{8}\pi / \frac{1}{Z^4}$

$\frac{80}{256}$

$0,3,10^6$
300
266

$\frac{4,6}{2}$

4,18 0,488

April 14

$$\frac{\varrho\, d\varrho\, d\vartheta\, dz}{r}$$

$$r^2 = (\varrho\cos\vartheta - x)^2 + (\varrho\sin\vartheta - y)^2 + (c-z)^2$$

$$r^2 = \varrho^2 - 2\varrho(x\cos\vartheta + y\sin\vartheta) + x^2 + y^2 + (c-z)^2$$

$$\cancel{r^2 = \varrho^2\left(1 - \frac{2x\cos\vartheta + 2y\sin\vartheta}{\varrho} + \frac{(c-z)^2}{\varrho^2}\right)}$$

$$a - x = a - \varrho\cos\vartheta$$

$$(a-x)^2 = \varrho^2\cos^2\vartheta - 2a\varrho\cos\vartheta$$

$$r^2 = \left(\varrho^2 + (c-z)^2\right)\left(1 - \frac{2\varrho(x\cos\vartheta + y\sin\vartheta)}{\varrho^2 + (c-z)^2}\right)$$

$$(a - \varrho\cos\vartheta)(b - \varrho\sin\vartheta)$$

$$\varrho^2\sin\vartheta\cos\vartheta - 2\varrho(a\cos\vartheta + b\sin\vartheta)$$

$$\frac{1}{r} = \frac{1}{\sqrt{\varrho^2 + (c-z)^2}}\left(1 + \frac{\varrho(x\cos\vartheta + y\sin\vartheta)}{\varrho^2 + (c-z)^2}\right)$$

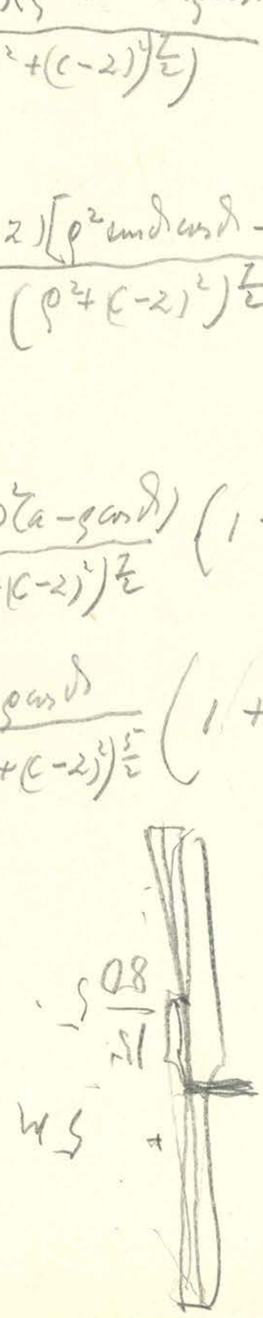
$$P_z = \kappa X \varrho\, d\varrho\, d\vartheta\, dz\, M\Bigg\{3\frac{c-z}{(\varrho^2 + (c-z)^2)^{\frac{5}{2}}}\left(1 + 5\frac{\varrho(a\cos\vartheta + b\sin\vartheta)}{\varrho^2 + (c-z)^2}\right)$$

$$-15\frac{(c-z)(\varrho^2\cos^2\vartheta - 2a\varrho\cos\vartheta)}{(\varrho^2 + (c-z)^2)^{\frac{7}{2}}}\left(1 + 7\frac{\varrho(a\cos\vartheta + b\sin\vartheta)}{\varrho^2 + (c-z)^2}\right)\Bigg\}$$

$$-\kappa Y \varrho\, d\varrho\, d\vartheta\, dz\, M\, 15\frac{(c-z)\left[\varrho^2\sin\vartheta\cos\vartheta - 2\varrho(a\cos\vartheta + b\sin\vartheta)\right]}{(\varrho^2 + (c-z)^2)^{\frac{7}{2}}}\left(1 + 7\frac{\varrho(a\cos\vartheta + b\sin\vartheta)}{\varrho^2 + (c-z)^2}\right)$$

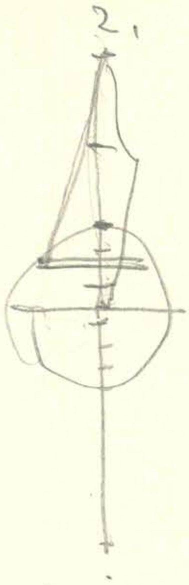
$$-\kappa Z \varrho\, d\varrho\, d\vartheta\, dz\, M\Bigg\{15\frac{(c-z)^2(a - \varrho\cos\vartheta)}{(\varrho^2 + (c-z)^2)^{\frac{7}{2}}}\left(1 + 7\frac{\varrho(a\cos\vartheta + b\sin\vartheta)}{\varrho^2 + (c-z)^2}\right)$$

$$-3\frac{a - \varrho\cos\vartheta}{(\varrho^2 + (c-z)^2)^{\frac{5}{2}}}\left(1 + 5\frac{\varrho(a\cos\vartheta + b\sin\vartheta)}{\varrho^2 + (c-z)^2}\right)$$



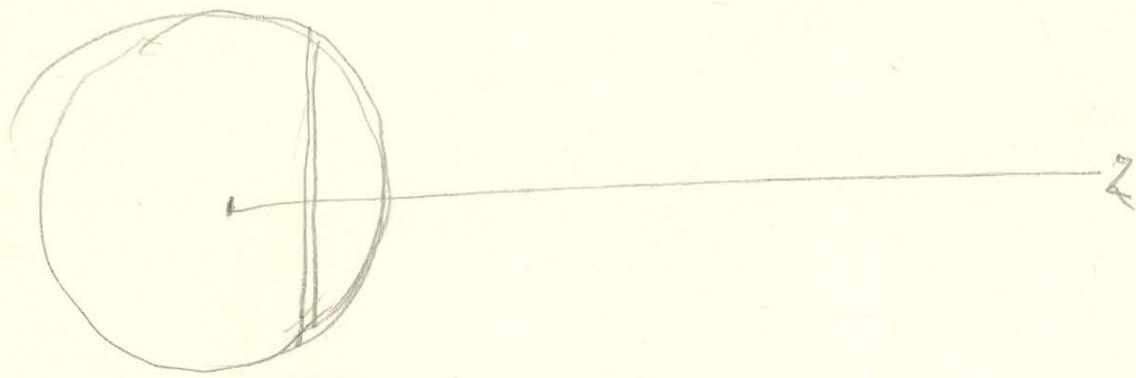
1880

320



$(R+z)$ = negatív

$(R-z)$ = pozitív

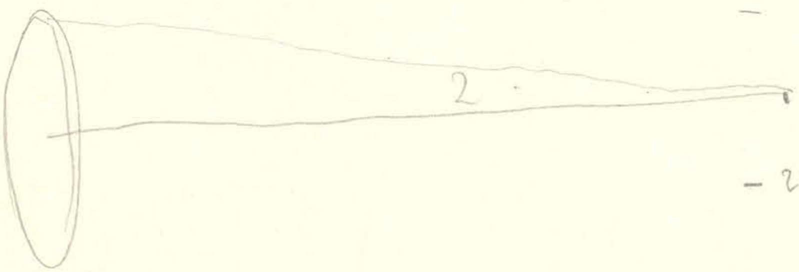


$$\frac{2\pi\, dc\,(c-z)}{\left(\rho^2+(c-z)^2\right)^{\frac{3}{2}}} - 2\pi\, dc$$

$$+\frac{2\pi\, l\, dc}{z} \qquad + 2\pi\, dc$$

$-$ $\qquad$ $+$

$$-\frac{2\pi\rho\, d\rho\, dc\, z}{(z^2+\rho^2)^{\frac{3}{2}}} -$$



$$-2\pi \int \frac{z\, dc}{\sqrt{\rho^2+z^2}}$$

ha z = + felől

$$\mp 2\pi \frac{(c-z)\, dc}{\sqrt{\rho^2+(c-z)^2}} \pm 2\pi\, dc$$

$$\mp 2\pi \frac{z}{\sqrt{\rho^2+z^2}} \pm 2\pi\, dc$$

Lehrö hatás.

$$\Big(2R^6+3R^4(-R+\xi')^2-6R^4(-R+\xi')(-R+h)-3R^2(-R+\xi')^3(-R+h)$$
$$+3R^2(-R+\xi')^2(-R+h)^2+(-R+\xi')^3(-R+h)^3\Big)$$

$R-\xi'=\varepsilon$

$h=R.$

$$\frac{2R^6+3R^4(-R+\xi')^2}{(R-\xi')^4\left(2R(R-\xi')+\xi'^2\right)^{\frac{3}{2}}}-\frac{2R^6+3R^4(-R+\xi')^2}{(R-\xi')^4(\xi'^2)^{\frac{3}{2}}}$$

$$2R\,\xi'^3 + 3R^4\xi'^2(-R+\xi')^2$$

$$\frac{2R^6+3R^4\varepsilon^2}{\varepsilon^4}\left(\frac{1}{\left(2R\varepsilon+(R-\varepsilon)^2\right)^{\frac{3}{2}}}-\frac{1}{\left((R-\varepsilon)^2\right)^{\frac{3}{2}}}\right)$$

$$\frac{1}{(R^2+\varepsilon)^{2\frac{3}{2}}}$$

$$\frac{2R^6}{\varepsilon^4}\,\frac{1}{R^3}\left(\frac{1}{\left(1+\frac{\varepsilon^2}{R^2}\right)^{\frac{3}{2}}}-\frac{1}{\left(1-\frac{\varepsilon}{R}\right)^{\frac{3}{2}}}\right)$$

$$\left(1-\frac{\varepsilon}{R}\right)^{2\frac{3}{2}}-\left(1+\frac{\varepsilon^2}{R^2}\right)^{\frac{3}{2}}$$

$$\frac{1}{(1+x)^{\frac{3}{2}}}=1-\frac{3}{2}x+\frac{3}{8}x^2-\frac{3}{2}\,\frac{1}{2}\,\frac{3}{2}\,\frac{1}{1\cdot2\cdot3}$$
$$\cancel{\tfrac{3}{2}x}\;+-\frac{3}{16}x^3+\frac{15}{32}x^4$$

$$1-\frac{3}{2}\frac{\varepsilon^2}{R^2}+\frac{3}{8}\frac{\varepsilon^4}{R^4}-\frac{3}{16}\frac{\varepsilon^6}{R^6}$$

$$1-\frac{3}{2}\frac{\varepsilon}{R}$$

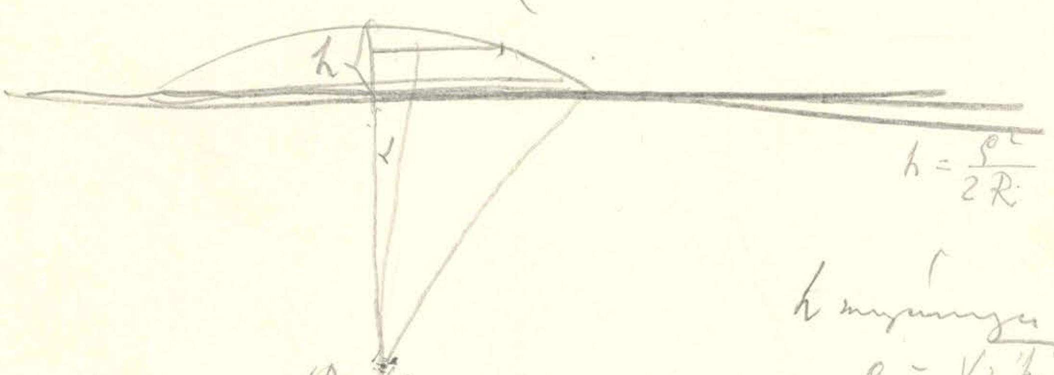
$$+2\frac{(c-z)^3\,dc}{r^5}+2\frac{\rho^2(c-z)\,d\sigma}{r^5}$$

$$-8\frac{(c-z)^3\,dc}{r^5}\quad -5\,\rho^2\frac{c-z}{r^5}\,d\sigma$$

$\rho^2 = R^2$

$$\frac{\partial X_1}{\partial z}=\pi\alpha\int_0^{\rho}3\rho^2\frac{c-z}{r^5}\,dc \qquad \rho^2+c^2=R^2$$

(R^2-c^2)



$h=\frac{\rho^2}{2R}\qquad \rho=\sqrt{2hR}$

h nagysága R összehasonlítva egyenlő
$\rho=\sqrt{2hR}$ nagyságú

$$\frac{\partial X}{\partial z}=-3\pi\alpha\int_{-R}^{-(R-h)}\frac{(R^2-c^2)(c-z)\,dc}{\left((R^2-c^2)+(c-z)^2\right)^{\frac{5}{2}}}$$

$$\frac{\partial X}{\partial z}=-3\pi\alpha\left[-R^2z\int_{-R}^{-(R-h)}\frac{dc}{\left((R^2+z^2)-2zc\right)^{\frac{5}{2}}}+R^2\int\frac{c\,dc}{(\quad)^{\frac{5}{2}}}+z\int\frac{c^2\,dc}{(\quad)^{\frac{5}{2}}}-\int\frac{c^3\,dc}{(\quad)^{\frac{5}{2}}}\right]$$

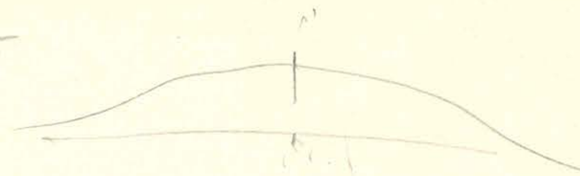
$$\frac{\partial X}{\partial z}=-\frac{3\pi\alpha}{(R^2+z^2-2zc)^{\frac{3}{2}}}\left[-\frac{R^2}{6^3}+R^2\left(\frac{-\left[(R^2+z^2)\mp 2zc\right]+\frac{1}{3}(R^2+z^2)}{2Z^2}\right)\right.$$

$$-\frac{z}{48Z^3}\left(\left((R^2+z^2)-2zc\right)^2+2(R^2+z^2)\left((R^2+z^2)-2zc\right)-\frac{1}{3}(R^2+z^2)^2\right)$$

$$-\frac{1}{8\cdot 16Z^4}\left(\frac{1}{3}\left((R^2+z^2)-2zc\right)^3-3(R^2+z^2)\left((R^2+z^2)-2zc\right)^2-3(R^2+z^2)^2\left((R^2+z^2)-2zc\right)\right.$$

$$\left.\left.+\frac{1}{3}(R^2+z^2)^3\right)\right]$$

$$-X = \int \alpha \frac{\partial^2(\frac{1}{r})}{\partial x^2} d\tau + \int \beta \frac{\partial^2(\frac{1}{r})}{\partial x \partial y} d\tau + \int \gamma \frac{\partial^2(\frac{1}{r})}{\partial x \partial z} d\tau$$



$$-\frac{\partial X}{\partial z} = \int \alpha \frac{\partial^3(\frac{1}{r})}{\partial x^2 \partial z} d\tau + \int \beta \frac{\partial^3(\frac{1}{r})}{\partial x \partial y \partial z} d\tau + \int \gamma \frac{\partial^3(\frac{1}{r})}{\partial x \partial z^2} d\tau$$

$x = 0 \qquad y = 0 \qquad d\tau = \rho\, d\rho\, d\alpha\, dc$

$a = \rho \cos\alpha \qquad b = \rho \sin\alpha.$

$r^2 = \rho^2 + (c-z)^2$

$$-\frac{\partial X}{\partial z} = \alpha \int \left(-3 \frac{c-z}{(\rho^2+(c-z)^2)^{\frac{5}{2}}} + 15 \frac{\rho^2 \cos^2\alpha\, (c-z)}{r^7}\right) \rho\, d\rho\, d\alpha\, dc$$

$$+ \beta \int 15 \frac{\rho^2 \sin\alpha \cos\alpha\, (c-z)}{r^7} \rho\, d\rho\, d\alpha\, dc + \gamma \int \left(-3 \frac{\rho \cos\alpha}{r^5} + 15 \frac{\rho \cos\alpha\, (c-z)^2}{r^7}\right) \rho\, d\rho\, d\alpha\, dc.$$

integrálva α szerint β és γ is független

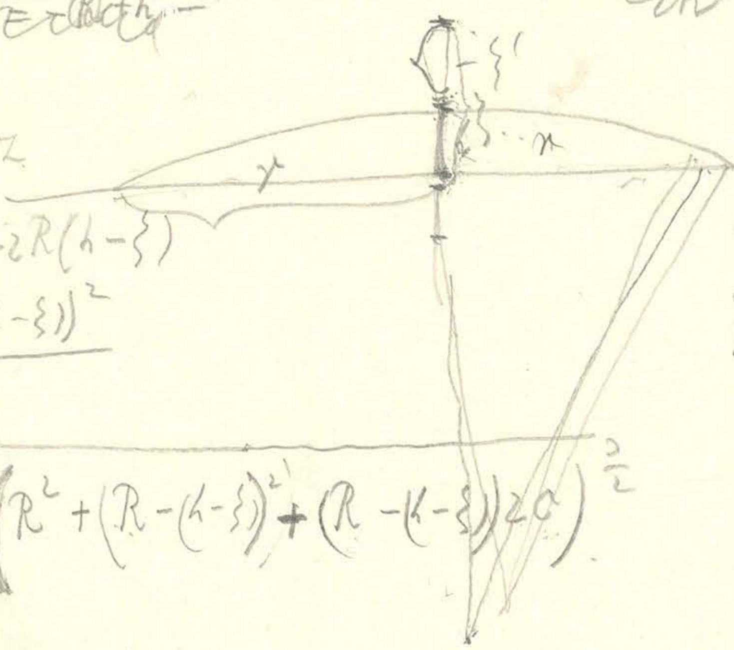
$$-\frac{\partial X}{\partial z} = 3\pi\alpha \left[-2 \int \frac{c-z}{(\rho^2+(c-z)^2)^{\frac{5}{2}}} \rho\, d\rho\, dc + 5 \int \frac{\rho^3 (c-z)\, d\rho\, dc}{(\rho^2+(c-z)^2)^{\frac{7}{2}}}\right]$$

$$-\frac{\partial X}{\partial z} = 3\pi\alpha \left[+\frac{2}{3} \int_0^\rho \frac{(c-z)\, dc}{(\rho^2+(c-z)^2)^{\frac{3}{2}}} - \frac{1}{3} \int_0^\rho \frac{(5\rho^2 + 2(c-z)^2)(c-z)\, dc}{(\rho^2+(c-z)^2)^{\frac{5}{2}}}\right]$$

$$\frac{\partial X}{\partial z} = +3\pi\alpha \iint_0^\rho \frac{\rho^2 (c-z)\, dc}{(\rho^2+(c-z)^2)^{\frac{5}{2}}}$$

$z = -R$

$\underline{h}$ $\quad z = -R + h + \xi$ $\qquad \rho$ $\qquad R = \frac{r^2}{2h}$ $\qquad \underline{z = -R + \xi'}$



$R^2 + z^2 = +(h-\xi)^2 + 2Rz$

$= (h-\xi)^2 + 2R^2 - 2R(h-\xi)$

$\underline{R^2 + (R-(h-\xi))^2}$

$$\frac{}{(R+(\xi-h))^4\left(R^2+(R-(h-\xi))^2+(R-(h-\xi))2c\right)^{\frac{3}{2}}}$$

$R^2 - (R-h)^2 = r^2$

$2Rh - h^2 = r^2$

$$\underline{R = \frac{r^2+h^2}{2h}}$$

felső határ
$$\frac{1}{(R-(h-\xi))\left(\cancel{R^2}+\cancel{R^2}-2\cancel{R(h-\xi)}+(h-\xi)^2-\cancel{2R^2}+2\cancel{R(h-\xi)}+2hR-2h(h-\xi)\right)}$$

felső határ
$$\frac{1}{(R-(h+\xi))^4\left(2h(R-(h+\xi))+(h+\xi)^2\right)^{\frac{3}{2}}}$$

$h + \xi = \xi'$

alsó határ
$$\frac{1}{(R-(h+\xi))^4\left((h+\xi)^2\right)^{\frac{3}{2}}}$$

$\underline{\text{nenyő}}$

felső határ
$$\frac{1}{(R-\xi')^4\left(2h(R-\xi')+\xi'^2\right)^{\frac{3}{2}}}$$

alsó határ
$$\frac{1}{(R-\xi')^4(\xi'^2)^{\frac{3}{2}}}$$

$$\frac{1}{24 z^2}\left(-4R^2z^2 - 4R^2(R^2+z^2) + 12R^2 z c\right)$$

$$8R^2z^2 - 4R^4 + 12 R^2 z c$$

$$\frac{R}{6 z^2}\left(2z^2 - R^2 + 3zc\right)$$

$$c = -R + h = -980$$

$$\frac{\partial X}{\partial z} = + \frac{\pi \alpha}{z^4\left((R^2+z^2) - 2zc\right)^{3/2}}\left(2R^6 + 3R^4z^2 - 6R^4zc - 3R^2z^3c + 3R^2z^2c^2 + z^3c^3\right)$$

$c = -1000$

$R = 1000 \quad h = 20$

$z = 1020$

$$z = -R\left(1 + \frac{z'}{R}\right) = z = R(1+\xi)$$

$$c = -R \qquad c' = -R\left(1 - \frac{h}{R}\right) = -R(1-\eta)$$

$$\frac{1}{\pi\alpha}\frac{\partial X}{\partial z} = -\frac{1}{R^7}\left(\frac{1}{(\xi-\eta)^{\frac{3}{2}}}\left(2R^6 + 3R^6(1+2\xi) - 3R^6 - 3R^6 + 3R^6 + R^6\right.\right.$$

$$\cancel{\frac{\partial X}{\partial z} = -\pi\alpha\frac{3}{R(2\eta)^{\frac{3}{2}}} + \frac{\pi\alpha}{R(\xi)^2} = -\alpha\frac{3\pi}{1000}}$$

limit $\frac{\partial X}{\partial z} = \alpha\, 0{,}000833.$

belief $\frac{\partial X}{\partial z} = + \alpha\, 0{,}002075$

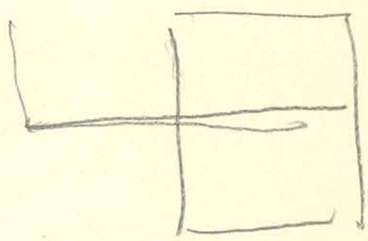
$\xi' = +R$

$h = +R.$

$$k\left\{-\frac{a}{n}\frac{1}{\sqrt{a^2+n^2}}+\frac{an\,\cancel{(a+\sqrt{a^2+b^2+n^2})}}{(b^2+n^2)\cancel{(a+\sqrt{a^2+b^2+n^2})}\sqrt{a^2+b^2+n^2}}\right.$$

$$k\left\{-\frac{a}{n}\frac{1}{\sqrt{a^2+n^2}}+\frac{an}{b^2+n^2}\,\frac{1}{\sqrt{a^2+b^2+n^2}}\right\}$$

$$\frac{k}{n^2}\left\{-\frac{a}{\sqrt{1+\frac{a^2}{n^2}}}+\frac{a}{1+\frac{b^2}{n^2}}\frac{1}{\sqrt{1+\frac{a^2}{n^2}+\frac{b^2}{n^2}}}\right\}$$



$\frac{a}{n}=1$

$\frac{b^2}{n}=3$ $\frac{b^2}{n}=1$

$$\frac{k}{n}\left\{-\cancel{\frac{1}{\sqrt{2}}}+\frac{1}{10}\frac{1}{\sqrt{11}}+\cancel{\frac{1}{\sqrt{2}}}-\frac{1}{2}\frac{1}{\sqrt{3}}\right\}$$

$$4\frac{k}{n}\left(-\frac{1}{3{,}4642}+\frac{1}{33{,}1660}\right)$$

$$\begin{array}{r} -0{,}2887 \\ +0{,}0302 \\ \hline 0{,}2585 \\ 1{,}0340 \end{array}$$

$0{,}0915\ V.$

$2{,}7+m=+1{,}0$

20
20
253

a_1

2.2

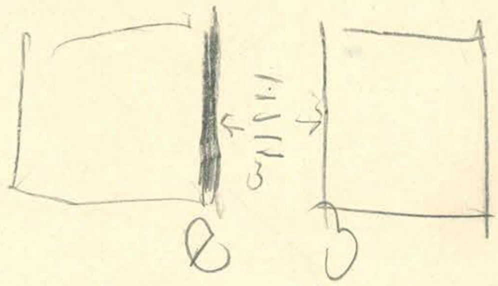
$$\frac{23000}{575}\cdot\frac{\overset{11000}{\cancel{66.11.15}}}{0{,}45}\,10^{-9}.$$

$$\frac{253\ 10^6}{231}\,10^{-9}$$

3

22

	236	
1	1.18	2.36
2	1.3924	
3	1.643032	3.286062
4	1.938777	
5	2.287757	4.575514
6	2.699553	
7	3.185472	6.370944



~~3.3188~~

1.4063	8.9595	2.8126
5.15625	23.5925	10.3125
6.84375	22.4890	13.6875
1.59375	3.76125	3.1875

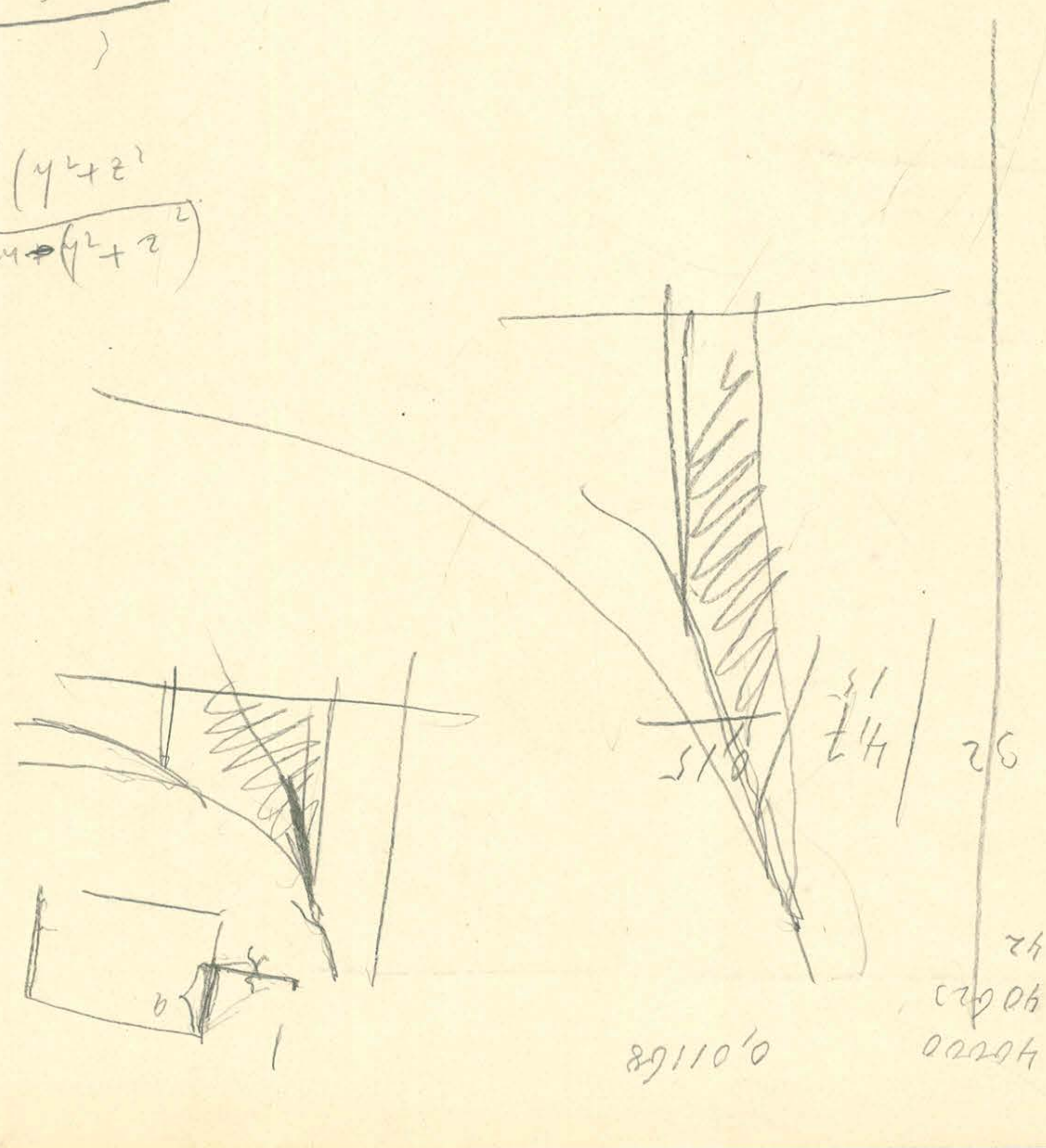
$$\frac{2.36}{1+\frac{1.3924}{(\quad)}}$$

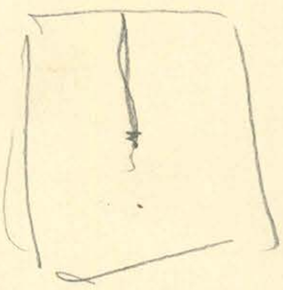
$$\frac{2u^2}{1+u^2}$$

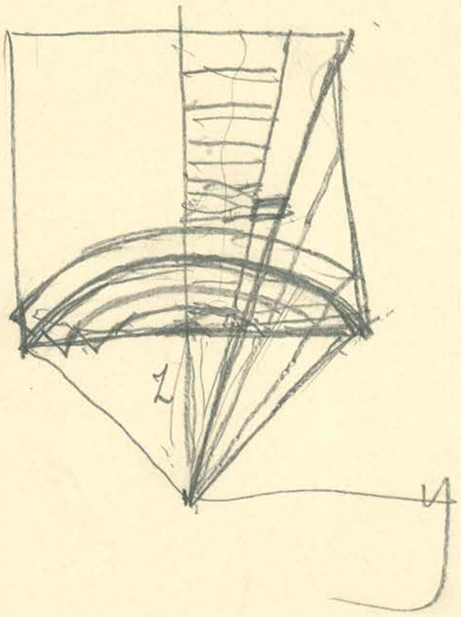
x = arctg u

4x = u

$$\frac{2.36(y^2+z^2)}{1.3924+(y^2+z^2)}$$







cos.

$dq = \rho\, d\rho\, d\alpha \cdot \sin\alpha$

$y^2 + z^2 = \rho^2$

$\rho \cos\alpha = z$:

$K M^2 \rho\, d\rho \cos\alpha\, d\alpha$

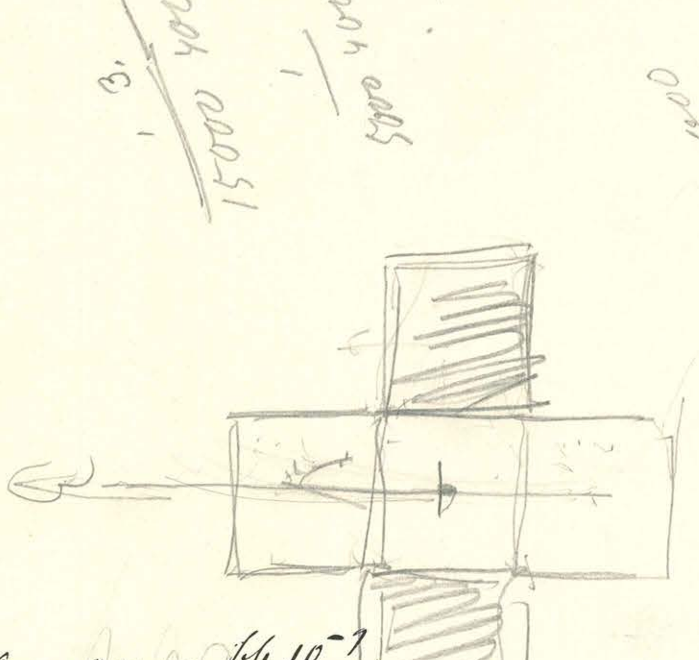
$\sin\alpha = \sqrt{1 - \frac{z^2}{\rho^2}}$ $\qquad \frac{1}{\rho^4} : \frac{1}{(\rho^2 + x^2)^2}$

$\cos\alpha\, d\alpha$: $\qquad \frac{\rho}{r} \qquad dz \qquad z\, \mathrm{tg}\, \alpha$: $\frac{z\, dr}{\cos^2\alpha} d\alpha$

cos an

A kocka gravitációs hatása $= f\sigma\, 21{,}3136.$

A kocka földnehézséges infláló hatása $\left\{ 0{,}03660\,K = \right.$ a momentum gyg... $\left.\right\}$



$0{,}028K. = 66\ 10^{-7}$

$K\ 28\ 10^{-?} = 66\ 10^{-9}$

$K = 2.10^{-6}$

22,6
11,3

I P_n $n = 33,9$ $a = b = 11,3$ $f\sigma$

$f\sigma\, 33,9 \operatorname{arctg} \frac{11,3^2}{33,9\sqrt{11.11,3^2}}$

$f\sigma .\ 11,3 \{ \log\ 11,3 +$

$n = b$

$b = c$ P

Parallelepipedon

$= \Big| f\sigma \Big\{ a \operatorname{arctg} \frac{bc}{a\sqrt{a^2+b^2+c^2}} + b\left(\log \frac{c+\sqrt{c^2+b^2}}{b} - \log \frac{c+\sqrt{a^2+b^2+c^2}}{\sqrt{a^2+b^2}}\right) + c\left(\log \frac{b+\sqrt{b^2+c^2}}{c} - \log \frac{b+\sqrt{a^2+b^2+c^2}}{\sqrt{a^2+c^2}}\right)\Big\}$

$n = c$

$b = a$

$a = b$

$\frac{11,3^3}{22,6^2}$ $8 \cdot \frac{11,3^3}{4} \cdot f\sigma$ $f\sigma\, 22,6.$

$4\left(P \begin{matrix} a = 33,9 \\ b = 11,3 \\ c = 11,8 \end{matrix}\right) - 4\left(P \begin{matrix} a = 11,3 \\ b = 11,3 \\ c = 11,8 \end{matrix}\right)$

11,3

$\log \frac{\sqrt{10}}{1+\sqrt{11}} \cdot \frac{1+\sqrt{3}}{\sqrt{2}}$

$4 f\sigma\, 11,3\left(3 \operatorname{arctg} \frac{1}{3\sqrt{11}} - \operatorname{arctg} \frac{1}{\sqrt{3}} + 2\log \frac{1+\sqrt{2}}{1+\sqrt{11}} \sqrt{10} - 2\log \frac{1+\sqrt{2}}{1+\sqrt{3}} \sqrt{2}\right)$

$\log \sqrt{5}\, \frac{1+\sqrt{3}}{1+\sqrt{11}}$

$\sqrt{11} = 0$

$\sqrt{11} = 3,3166$

$\sqrt{3} = 1,7321$

$4 f\sigma\, 11,3\left(3 \operatorname{arctg} \frac{1}{3\sqrt{11}} - \operatorname{arctg} \frac{1}{\sqrt{3}} + 2 \log \sqrt{5}\, \frac{1+\sqrt{3}}{1+\sqrt{11}}\right)$

$- 0,22311$ $+ 2 \log \sqrt{5} \cdot \frac{4,3166}{2,7321}$

~~1093,4495~~ $\delta = 1,9$

$\boxed{f\sigma\, 21,3136} = 265810^{-9}$

2,7 $0,5\ \frac{a}{c}$ a nagyobb

0,349485
436497
0,785982
0,635142
0,150840

0,349485
0,655742
0,984627
0,4264973
~~1,4211124~~
0,548130

0,520697
477121
0,997818
9,002182
5° 44′ 20″
17° 13′ 12° 47′
0,20944
1,5672311

0,238561
9,761439
30° 0′
17 13

0,347324
0,694648
22311
0,471547452

3,272280
6,54456
22311
~~6,76767~~

6,32145
1,262124
2,524248
22311
2,30114

$dz \frac{\xi}{x^5}$ $\xi = \frac{z}{x}$

$\frac{z}{x} = \xi$

$\frac{dz}{z^5} \xi^6$ $\frac{1}{x^5} \cdot \frac{\xi^5}{z^5}$

225
127,69
352,69
48038

127,69
1413,76
1541,45
166914

$l = x = 11,3$

$\varrho^2 = \overline{15}^2 + \overline{11,3}^2$ $\varrho'^2 = \overline{37,6}^2 + \overline{11,3}^2$

$4k \cdot 127,69 \left(\frac{1}{352,69 \sqrt{480,38}} - \frac{1}{1541,45 \sqrt{1669,14}} \right)$

~~22,00~~
21,92
40,85

$2 \cdot 10^{-6}$
$\frac{1}{540000}$

0,000129350
15881
0,000113479
0,0144901
90579604

$0,028\, k = \frac{1}{15 \cdot km} \frac{60 \cdot 10^{-9}}{28} 10^{3}$

4,10
118
6 | 5,28 | 0,88

$k \cdot \frac{0,88}{11,3^4} \cdot 162$

$4k\, \overline{11,3}^2 \left(\frac{1}{2 \cdot \overline{11,3}^2\, 11,3 \sqrt{3}} - \frac{1}{10 \cdot \overline{11,3}^2 \cdot 11,3 \sqrt{11}} \right)$

1286
1286
141,46

$\frac{2k}{11,3} \left(\frac{1}{\sqrt{3}} - \frac{1}{5\sqrt{11}} \right)$

$\frac{141}{11,3^4}$

0,577324
0,060303
0,517031
1,034062
0,0915099
160

$K \cdot 0,0915 \cdot 0,4$
0,03660 K
0,00859 K

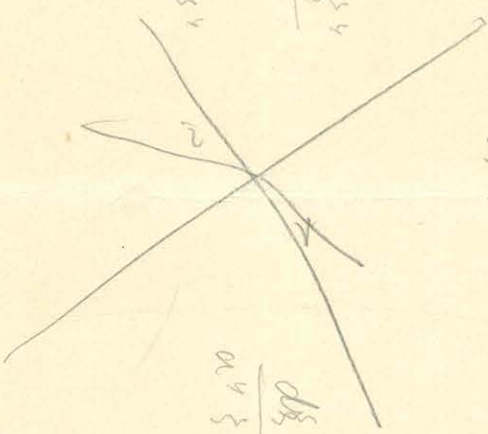
0,0750 . K 0,4
$0,0300\, k = \frac{1}{8 \cdot km}$

$\frac{141}{16405}$

$K = \frac{1}{280000}$

~~12,69~~

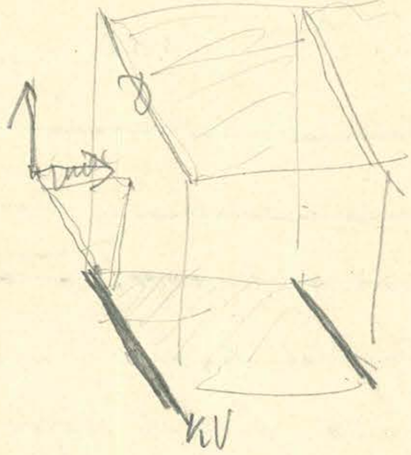
Uraim! Engedjék meg, hogy kerülve minden szónoklási próbálkozást egyszerű szavakkal jelentsem be elnökünknek Gyulay Pálnak halálát. Egyesületünknek ő egyik alapítója és első titkára volt. ~~Ki annak [illegible] [illegible] [illegible] [illegible] [illegible]~~ ~~[illegible] [illegible] [illegible] [illegible] [illegible] [illegible], a [illegible]~~ ~~[illegible] [illegible] [illegible] [illegible] [illegible]~~ ~~[illegible] [illegible] [illegible] [illegible]~~ A mit alapítóként kezdett azt folytatta mi velünk, s ebben az egyesületben és mint mindenütt a hol közreműködött ő volt a mi igazi vezérünk, ~~mert~~ [illegible] hogy

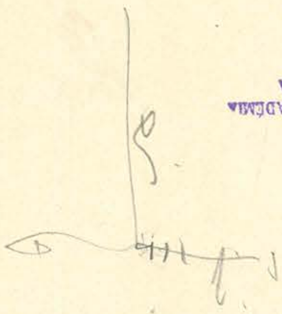


1669. IV.

$\frac{\partial X}{\partial z}$

$\frac{\partial Z}{\partial x}$





$\rho = z^2 + x^2$

22,6
11,3

$\frac{\rho\, dl}{(\rho^2+l^2)^{\frac{3}{2}}} k \quad = 2k \frac{l \rho}{\rho^2 \sqrt{\rho^2+l^2}}$

$4k \frac{l x}{\rho^2 \sqrt{\rho^2+l^2}} - 4k \frac{l x}{\rho'^2 \sqrt{\rho'^2+l^2}}$

$k, 0,07 = \frac{1}{7\ m.}$

$\frac{1}{70000}$

$l = x = 11,3$

$\overline{11,3}^2 = 127,69$

$\rho^2 = \overline{11,3}^2 + \overline{11,3}^2$ $\qquad \rho'^2 = \overline{33,9}^2 + \overline{11,3}^2$

$\cancel{\rho =}$ $\qquad \rho' = 22,6$

$4k . 127,69 \left(\frac{1}{255,38 \sqrt{383,07}} - \frac{\quad}{\quad} \right.$

127,69

0,577334
223604
353730

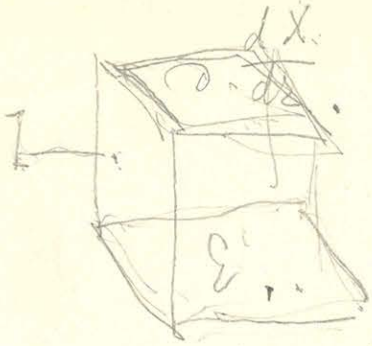
$\sqrt{3} = 1,7321$
$\sqrt{5} = 2,2361 = 0,447207.$

162
0,06349 $\qquad$ 0,4
0,025396
0,0160
90-

$4k \left(\frac{1}{2\sqrt{383,07}} - \frac{1}{4V} \right.$

$\frac{4k}{11,3} \left(\frac{1}{2\sqrt{3}} - \frac{1}{4\sqrt{5}} \right) = \frac{k\,2}{11,3} \left(\frac{1}{\sqrt{3}} - \frac{1}{2\sqrt{5}} \right)$

0,35373
0,71746



$P_a \quad n=(a-z) \quad a$ ~~...~~

P_a ~~...~~

$$P = kV\left\{\log\frac{b+\sqrt{b^2+(c-z)^2}}{c-z} - \log\frac{b+\sqrt{a^2+b^2+(c-z)^2}}{\sqrt{a^2+(c-z)^2}}\right\}$$

$$\frac{\partial P}{\partial z} = kV\left\{\frac{(c-z)}{b+\sqrt{b^2+(c-z)^2}}\cdot\frac{\left(b+\sqrt{b^2+(c-z)^2}\right)}{(c-z)^2}\right.$$

$$-\frac{c-z}{b+\sqrt{b^2+(c-z)^2}}\cdot\frac{(c-z)}{(c-z)\sqrt{b^2+(c-z)^2}}$$

$$-\frac{\sqrt{a^2+(c-z)^2}}{b+\sqrt{a^2+b^2+(c-z)^2}}\left(\frac{(c-z)\left(b+\sqrt{a^2+b^2+(c-z)^2}\right)}{\left(a^2+(c-z)^2\right)^{\frac{3}{2}}}\right.$$

$$\left.\left.-\frac{(c-z)}{\sqrt{a^2+(c-z)^2}\sqrt{a^2+b^2+(c-z)^2}}\right)\right\}$$

$$\frac{\partial P_2}{\partial z} = kV\left\{\frac{1}{c} - \frac{c}{\left(b+\sqrt{b^2+c^2}\right)\sqrt{b^2+c^2}} - \frac{c}{a^2+c^2} + \frac{c}{\left(b+\sqrt{a^2+b^2+c^2}\right)\sqrt{a^2+b^2+c^2}}\right\}$$

$$\left[\left(z\frac{\partial P}{\partial z}\right)_{\substack{a=22,9\\ b=11,3\\ c=11,3}}\right] - \left[\left(y\frac{\partial P}{\partial z}\right)_{\substack{a=11,3\\ b=11,3\\ c=11,3}}\right]$$

$dv = da\,db\,dc$

$i_x = \frac{i}{4\pi}\frac{a}{(a^2+b^2+c^2)^{\frac{3}{2}}}$

$\rho^2 = (a^2+b^2+c^2) + (x^2+y^2+z^2) - 2ax - 2by - 2cz$

$$\frac{c\,dc\,da\,db\,dc}{(a^2+b^2+c^2)^{\frac{3}{2}}(\rho^3}$$

$$\frac{r\,dr}{(r^2+c^2)^{3/2}(a+br+r^2)^{3/2}}$$

$(r^2+d)^3$

$((r^2+c^2)(r^2+br+a))^{3/2}$

$(r^4 + a_2 r^2 + a_3 r + a_4)^{3/2}$

$a + br + r^2 = y$

$(b+2r)dr = dy$

$\frac{1}{10m}$

r^2+c

$\frac{1}{r} = z$

$\frac{1}{r^2}dr = dz$

$dr = z^2 dz$

$r^3 + a_1 r^2 + a_2 + \frac{a_3}{r}$

$a_1 r^2 + a_3$

$\frac{1}{z^3} + \frac{a_1}{z^2} + a_2 + a_3 z$

$a_1 r + a_3$

$r^2(r^2 + a_1)$

1,9

21

10

11,543

797,00

10

10

0,000797

2,50

2,17

1,19

19,17

2,09

291

2,7

1,4

401	404	409	416	425	436	444	464	481	500
0,603144	0,606381	0,611723	0,619093	0,628389	0,639486	0,652246	0,666518	0,682145	0,698970
0,301572	0,303191	0,305862	0,309547	0,314195	0,319743	0,326123	0,333259	0,341073	0,349485
2,111004	2,122337	2,141034	2,166829	2,199365	2,238201	2,282861	2,332813	2,387511	2,446395
0,449108	449108	449108	449108	449108	449108	449108	449108	449108	449108
0,338104-2	0,326771-2	0,308074-2	0,282279-2	0,249743-2	0,210907-2	0,166247-2	0,116295-2	0,061597-2	0,002713-2
665722-1	0,664303-1	0,662021-1	0,658851-1	654802-1	0,649977-1	0,644370-1	0,638130-1	631241-1	0,623787-1
0,003826-2	0,991074-3	0,970095-3	0,941130-3	0,904545-3	0,860884-3	0,810617-3	0,754425-3	0,692838-3	0,626500-3
9,698428	9,696809	9,694138	9,690453	9,685805	9,680257	9,673877	9,666741	9,658926	9,650515
26°32'10"	26°27'0	26°18'40"	26°7'10"	25°52'40"	25°35'30"	25°15'50"	24°54'10'	24°30'40"	24°5'40"
0,45379	0,45379	0,45379	0,45379	0,43633	0,43633	0,43633	0,41888	0,41888	0,41888
931	785	524	204	1513	1018	436	1571	873	145
5	0	19	5	19	15	24	5	19	19
0,46315	0,46164	0,45922	0,45588	0,45165	0,44666	0,44093	0,43464	0,42780	0,42052

400

0,602060
0,301030
2,107210
449108
0,341898-2
666172-1
0,008070-2

9,698970
26°33'50"
0,45379
960
24
0,46363

167434
72

21689
2169
23858

4,38920

438920
11,3
34920
3492
38423

11,2

0,08087
0,15718
0,30236
0,33337

1,01	1,04	1,09	1,16	1,25	1,36	1,49	1,64	1,81	2
0,004321	0,017033	0,037426	0,064458	0,096910	0,133539	0,173186	0,214844	0,257679	0,301030
0,002161	0,008517	0,018713	0,032229	0,048455	0,066770	0,086593	0,107422	0,128840	0,150515
0,015127	0,059619	0,130991	0,225603	0,339185	0,467390	0,606151	0,751954	0,901880	1,053605
0,449108	0,449108	0,449108	0,449108	0,449108	0,449108	0,449108	0,449108	0,449108	0,449108
0,433981	0,389489	0,318117	0,223505	0,109923	9,981718-1	0,842957-1	0,697154-1	0,547228-1	0,395503-1
0,893722-1	0,889638-1	0,883019-1	0,874087-1	0,863168-1	0,850548-1	0,836552-1	0,821500-1	0,805623-1	0,789207-1
0,327704	0,279127	0,201136	0,097692	0,973091-1	0,832266-1	0,679509-1	0,518654-1	0,352851-1	0,184710-1
9,997839	9,991483	9,981287	9,967771	9,951545	9,933230	9,913407	9,892578	9,871160	9,849485
44°51'20"	44°26'20"	43°46'0"	42°52'20"	41°48'40"	40°36'50"	39°19'30"	37°59'10	36°37'20"	35°15'50"
0,76794	0,76794	0,75049	0,73304	0,71559	0,69813	0,68068	0,64577	0,62832	0,61087
1484	756	1338	1513	1396	1047	553	1716	1076	436
15	10	0	15	19	24	15	5	10	24
0,78293	0,77560	0,76387	0,74832	0,72974	0,70884	0,68636	0,66298	0,63918	0,61547

45°

0,78540

3,1416

~~12,4248~~

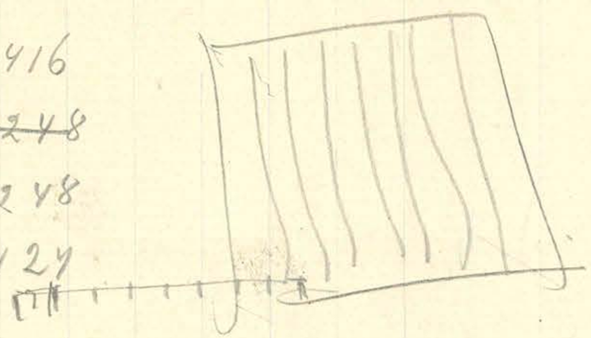
9,4248

4,7124

0,449108

0,895091 -1

0,344199



18,0238

9,5227

19,8988

18750

186238

9527

95227

9,4536

85700

180236

K $\frac{162}{100000}$ 4

36,6476

40,4446

$\frac{648}{100000}$ K

$\frac{1}{150}$ $\frac{1}{10000}$

$\frac{1}{2000000}$

4,01	4,04	4,09	4,16	4,25	4,36	4,49	4,64	4,81	5,00
0,603144	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

0,352183	0,354108	0,359835	0,369216	0,382017	0,397940	0,416641	0,437751	0,460898	0,485721	0,511883
0,176092	0,177054	0,179918	0,184608	0,191009	0,198970	0,208321	0,218876	0,230449	0,242861	0,255942
1,232644	1,239378	1,259426	1,292256	1,337063	1,392790	1,458247	1,532132	1,613143	1,700027	1,791594
449108	449108	449108	449108	449108	449108	449108	449108	449108	449108	449108
0,216464 -1	0,209730 -1	0,189682 -1	0,156852 -1	0,112045 -1	0,056318 -1	0,990861 -2	0,916976 -2	0,835965 -2	0,749081 -2	0,657514 -2
0,769370 -1	0,768594 -1	0,766383 -1	0,762656 -1	0,757609 -1	0,751233 -1	0,743698 -1	0,735144 -1	0,725699 -1	0,715452 -1	0,704528 -1
0,985834 -2	0,978324 -2	0,956065 -2	0,919508 -2	0,869654 -2	0,807551 -2	0,734559 -2	0,652120 -2	0,561664 -2	0,464533 -2	0,362042 -2
9,823908	9,822946	9,820082	9,815392	9,808991	9,801030	9,791679	9,781124	9,769551	9,757139	9,744058
33° 41' 20"	33° 37' 50"	33° 27' 20"	33° 10' 20"	32° 47' 20"	32° 18' 40"	31° 45' 20"	31° 8' 10"	30° 28' 0"	29° 45' 20"	29° 1' 0"
0,57596	0,57596	0,57596	0,57596	0,55851	0,55851	0,54105	0,54105	0,52360	0,50615	0,50615
1193	1076	785	291	1367	524	1309	233	814	1309	29
10	24	15	10	10	19	10	5	0	10	0
0,58799	0,58694	0,58396	0,57897	0,57228	0,56394	0,55424	0,54343	0,53174	0,51934	0,50644

0,5
1,5

225

0,6206
1,1922

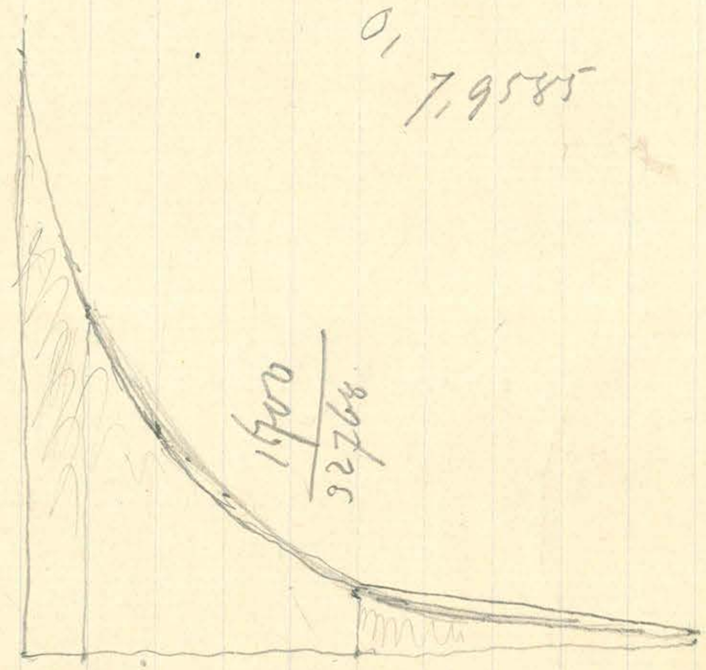
$4^2 = 16$
$4^3 = 64$
$4^4 = 256$
$4^5 = 1024$
$4^6 = 4096$
$4^7 = 16384$

$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^5 = 32$
$2^6 = 64$
$2^7 = 128$

2,3844
2,6325
0,26335
3950

354240

0,
7,9585



$$-\frac{3\pi\alpha}{(\ )^{3/2}\,24z^4}\Big[-8R^2z^4+12R^2z^2\Big(-\frac{2}{3}(R^2+z^2)+2zc\Big)-$$

a^2+b $\quad a^2 b$

$2a^6+b^3 \quad 2a^3+ab$

a^6-2a^3b

$2a^3b+b^3$

a^3b-ab^2

$R^4+2R^2z^2+z^4$

$$-6z^2\Big(+\frac{8}{3}(R^2+z^2)^2-8(R^2+z^2)zc+4z^2c^2\Big)$$

$+R^6+3R^4z^2+3R^2z^4+z^6$

$$-3\Big(-\frac{16}{3}(R^2+z^2)^3+16(R^2+z^2)^2zc-8(R^2+z^2)z^2c^2-\frac{8}{3}z^3c^3\Big)$$

$$8\Big[2R^6+3R^4z^2-3R^2z^3c-3R^4zc+3R^2z^2c^2+z^3c^3\Big)$$

$$(R^2+z^2)^3-6(R^2+z^2)^2zc+12(R^2+z^2)z^2c^2-8z^3c^3$$

$$R^6+3R^4z^2+3R^2z^4+z^6-6R^4zc-12R^2z^3c-6z^5c+12R^2z^2c^2$$

$$\Big((2R^2+z^2)+z(z-c)\Big)^3$$

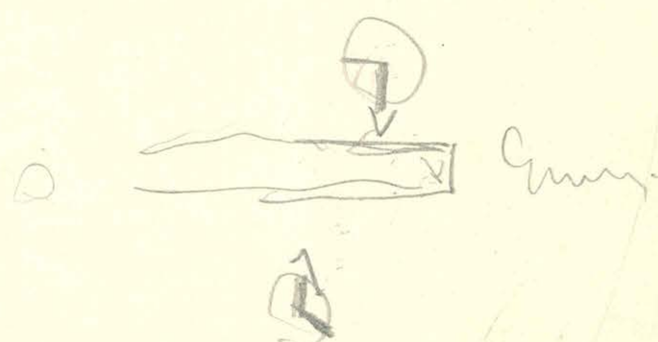
$$8\Big[2R^6+3R^4z(z+c)-3R^2z^2c(z-c)+z^3c^3$$

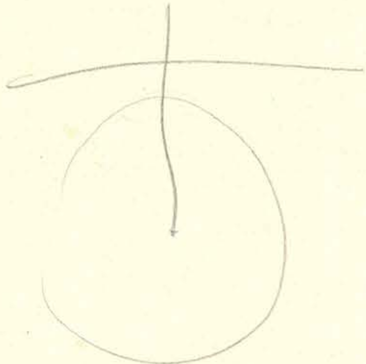
$$+3R^2z(z-c)(R^2-z^2)$$

$$(2R^2+z^2)^3=8R^6+12R^4z^2+6R^2z^4+z^6$$

$(R^2+z^2)+(z-c)$

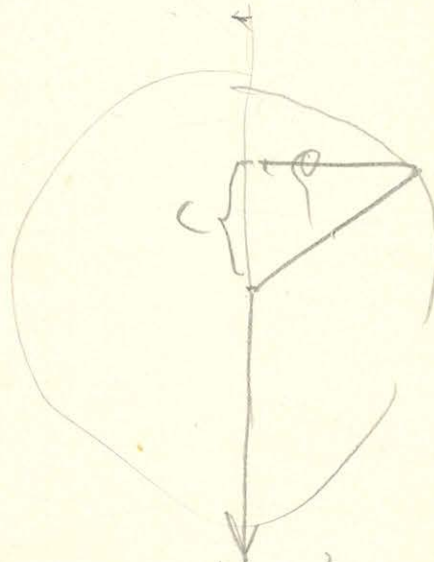
z





$e_i c$

$$\frac{(z-c)\,\varrho\, d\varrho\, d\varepsilon\, dc}{(\varrho^2+(z-c))^{\frac{3}{2}}}$$



$$\varrho^2 = R^2 - c^2$$

$$R^2 - c^2 + z^2 + c^2 - 2zc$$

$$2\pi\,\frac{(c-z)\,\varrho\, d\varrho}{(\varrho^2+(c-z)^2)^{\frac{3}{2}}}\,dc$$

$$-2\pi\int\frac{(c-z)\,dc}{\sqrt{\varrho^2+(c-z)^2}}$$

$$-2\pi\,\frac{(c-z)\,dc}{\sqrt{\varrho^2+(c-z)^2}} + 2\pi\,dc$$

$$-2\pi\,\frac{(c-z)\,dc}{\sqrt{(R^2+z^2)-2zc}} + 2\pi\,dc$$

$$-2\pi\int\frac{c\,dc}{\sqrt{(R^2+z^2)-2zc}} + 2\pi z\int\frac{dc}{\sqrt{\cdots}} + 4\pi R$$

$$-2\pi\left(\frac{1}{3}(R^2+z^2-2zc)-(R^2+z^2)\right)\frac{2\sqrt{\;}}{4z^2} - 2\pi\sqrt{\;}$$

$$+4\pi R - \left(\frac{1}{3}(R-z)^2-(R^2+z^2)\right)\frac{4\pi(R-z)}{4z^2} - 2\pi(R-z)$$

$$+\left(\frac{1}{3}(R+z)^2-(R^2+z^2)\right)\frac{4\pi(R+z)}{4z^2} + 2\pi(R+z)$$

$$+4\pi(R+z) - \frac{\pi}{z^2}\left(\frac{1}{3}(R-z)^3-\frac{1}{3}(R+z)^3 - \cancel{R(R^2+z^2)} + \cancel{R(R^2+z^2)} + z(R^2+z^2) + z(R^2+z^2)\right)$$

$$-2R^2z - \frac{2}{3}z^3 + 2zR^2 + 2z^3$$

$$+\frac{\pi\alpha}{z^4(R-z)^3}\left(2R^6+\cancel{3R^4z^2}-6R^5z-\cancel{3R^3z^3}+\cancel{3R^4z^2}+\cancel{R^3z^3}\right.$$

$$2\left(R^6+3R^4z^2-R^3z^3-3R^5z\right)$$

$$2\left(\cancel{R^5(R-3z)-R^3(3R}\right.$$

$$2R^3\left(R^3-3R^2z+3Rz^2-z^3\right)$$

$$+\frac{2\pi\alpha R^3}{z^4}$$

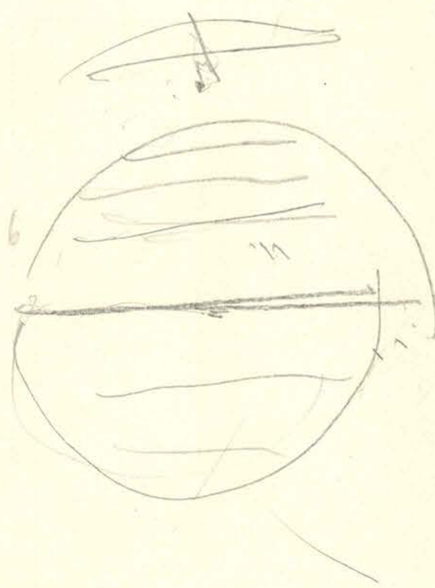
$$-\frac{\pi\alpha}{z^4(R+z)^3}\left(\cancel{2R^6}+\cancel{3R^4z^2}+\cancel{6R^5z}+3R^3z^3+\cancel{3R^4z^2}+R^3z^3\right)$$

$$2R^3\left(R^3+3R^2z+3Rz^2+z^3\right)$$

$$3\frac{M}{z^4}$$

$$-\frac{\pi\alpha}{z^4}2R^3$$

$$\frac{\pi\alpha}{z^4R^3}2R^6-\frac{\pi\alpha}{z^4R^3}2R^6$$



$$\frac{\pi\alpha R^4}{z^4(R^2+z^2)^{\frac{3}{2}}}\left(2R^2+3z^2\right)-\frac{\pi\alpha}{z^4}2R^3($$

$$\boxed{\frac{4\pi\alpha R^3}{z^4}}$$

$$\boxed{\frac{4}{3}\pi\alpha R^3}$$

$$4\pi(R+z)-\frac{4}{3}\pi z$$

$$\frac{4}{3}\pi\left(3R+2z\right)$$

$$\frac{R^3}{z^2}$$

$$-\frac{\pi}{z^2}\left(+\frac{2}{3}R^3+\frac{2}{R}Rz^2-R(R^2+z^2)-R(R^2+z^2)+\cancel{z(R^2+z^2)-z(R^2+z^2)}\right)-4\pi R$$

$$\frac{\pi}{z^2}\left(-\frac{4}{3}R^3\right.$$

$$\frac{\partial X}{\partial z} = -\frac{3\pi\alpha}{((R^2+z^2)-2zc)^{3/2}\,24z^4}\Big[-8R^2z^4 - 12R^4z^2 - 12R^2z^4 + 24R^2z^3c + 4R^4z^2 + 4R^2z^4$$

$$-(6R^4z^2 + 12R^2z^4 + 6z^6 - 24R^2z^3c - 24z^5c + 24z^4c^2 +$$

$+$

$$8\Big(\tfrac{1}{3}(R^2+z^2)^3 - \tfrac{6}{3}(R^2+z^2)^2 zc + \tfrac{12}{3}(R^2+z^2)z^2c^2 - \tfrac{8}{3}z^3c^3$$

$$-3(R^2+z^2)^3 + 12(R^2+z^2)^2 zc - 12(R^2+z^2)z^2c^2 \qquad -6+\tfrac{2}{3}$$

$$-3(R^2+z^2)^3 + 6(R^2+z^2)^2 zc \qquad 18 \quad +6$$

$$+\tfrac{1}{3}(R^2+z^2)^3 \qquad -\tfrac{18}{3}+\tfrac{1}{3}$$

6 18 18

18 36

36

$-8R^2z^4$ $\quad$ $+16R^6$ $\quad$ $-48R^4zc$ $\quad$ $-96R^2z^3c$ $\quad$ $-12z^5c$ $\quad$ $-48z^5c$

$-8R^2z^4$ $\quad$ $-8R^4z^2$ $\quad$ $+24R^2z^3c$

$-32R^2z^4$ $\quad$ $-16R^4z^2$ $\quad$ $+48R^2z^3c$ $\quad$ $-16z^6$ $\quad$ $+48z^5c$ $\quad$ $-24z^4c^2$

$+48R^2z^4$ $\quad$ $+48R^4z^2$ $\quad$ $+16z^6$

$+24R^2z^2c^2$ $\quad$ $+24z^4c^2$

$+8z^3c^3$

$$+16R^6 + 24R^4z^2 + 48R^2z^3c - 12R^4zc + 24R^2z^2c^2 + 36z^5c + 8z^3c^3$$

$$4(R^2+z^2) - 2zc$$

$$\boxed{+16R^6 + 24R^4z^2 - 24R^2z^3c - 24R^4zc + 24R^2z^2c^2 + 8z^3c^3}$$

$$-16z^3c^3 + 16z^3c^3$$

$$((R^2+z^2)^{3/} - z(z-c))^3$$

$$2R^2+zc$$

$$+8R^2($$

$$4(R^2-2zc)^3$$

$$+24R^2(R^2z - z^3c)$$

$$z(2R^2-2zc)^3$$

$$24R^2z(R^2 - z^2c - R^2c + zc^2)$$

$$24(R^4z^2 - R^2z^3c + z^3c^3)$$

16
64
256
1024

$$\frac{\partial P_2}{\partial c} = k\pi X \frac{1}{\rho^2}\int_{-4}^{+2} \frac{d\xi}{(1+\xi^2)^{\frac{7}{2}}}\left(3 + 2\xi^2 + 4\xi^4\right)$$

$$\frac{\partial P_2}{\partial c} = k\pi X \frac{1}{\rho^2}\left\{3\int_{-4}^{+2}\frac{d\xi}{(1+\xi^2)^{\frac{7}{2}}} + 2\int\frac{\xi^2 d\xi}{(1+\xi^2)^{\frac{7}{2}}} + 4\int_{-4}^{+2}\frac{\xi^4 d\xi}{(1+\xi^2)^{\frac{7}{2}}}\right\}$$

$$\left(\cancel{\frac{8}{5}}\xi^5 + 4\xi^3 + \xi + \cancel{\frac{4}{15}\xi^5} + \frac{2}{3}\xi^3 + \cancel{\frac{4}{5}\xi^5}\right)\frac{1}{(1+\xi^2)^{\frac{5}{2}}}$$

$$k\pi X \frac{1}{\rho^2}\frac{1\rho^5}{(\rho^2+(c-z)^2)^{\frac{5}{2}}}\left(\frac{z-c}{\rho} + \frac{14}{3}\left(\frac{z-c}{\rho}\right)^3 + \frac{8}{3}\left(\frac{z-c}{\rho}\right)^5\right)$$

$$\left(\frac{8}{3}\xi^5 + \frac{14}{3}\xi^3 + \xi\right)\frac{1}{(1+\xi^2)^{\frac{5}{2}}}$$

8192
908

$$\left\{\left(\left(\frac{8}{3}32 + \frac{112}{3} + \frac{6}{3}\right)\frac{1}{5^{\frac{5}{2}}}\right) + \left(\frac{8}{3}1024 + \frac{896}{3} + \frac{12}{3}\right)\frac{1}{(17)^{\frac{5}{2}}}\right\}$$

256
118

$$\frac{364}{3}\frac{1}{5^{\frac{5}{2}}} + \frac{9100}{3}\frac{1}{17^{\frac{5}{2}}}$$

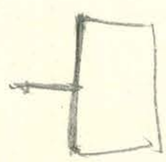
62500
$1310000\,5.10^{-6}$

289
867

$\boxed{75}$

$$\frac{364}{15}$$

10,8522
2,1704
2,5456
4,7160



3,1416
12,5664
5,9271

7200
4K

$$\frac{\partial P_2}{\partial c} = -k \cdot 0{,}0926$$

$$\frac{\partial P_1}{\partial c} = -306\,10^{-9}$$

$$= k\pi X M\,3\rho^2\int_{-32}^{+16}\frac{dz(z-c)}{(\rho^2+(z-c)^2)^{\frac{5}{2}}}$$

$$-k\pi X M\rho^2\frac{1}{(\rho^2+(c-z)^2)^{\frac{3}{2}}}$$

$$-k\pi X M\frac{1}{\rho}\frac{1}{\left(1+\frac{c^2}{\rho^2}\right)^{\frac{3}{2}}}$$

97,4
19,48
2,0454

$$-k\pi M M\frac{1}{\rho}\left\{\frac{1}{5^{\frac{3}{2}}} - \frac{1}{17^{\frac{3}{2}}}\right\}$$

$-k\,0{,}02952\,M$ $\quad k = 0{,}5$ $\quad X = 0{,}41\left\{\frac{1}{11{,}1805} - \frac{1}{70{,}0927}\right\}$

$-0{,}0974\,X = -0{,}0205$

71

14

$$K\cdot\frac{1600}{1838}\cdot 4{,}5$$

$$K\,1600\cdot 30\,\frac{0{,}15}{3{,}56}$$

$\partial\,1416$

0,0894414
0,0142668
0,0751175
0,009397

$$-k\pi X M \frac{1}{\varrho} \left| \frac{1}{(1+\xi^2)^{\frac{3}{2}}} \right|_{-4}^{+2} + k\pi Z M \frac{1}{\varrho^2} \left| \frac{1}{(1+\xi^2)^{\frac{5}{2}}} \left(\xi + \frac{14}{3}\xi^3 + \frac{8}{3}\xi^5 \right) \right|_{-4}^{+2}$$

$$-k\pi \frac{0,21}{8} \left(\frac{1}{5^{\frac{3}{2}}} - \frac{1}{17^{\frac{3}{2}}} \right) + k\pi \frac{0,4}{64} \left| \left(\frac{1}{5^{\frac{5}{2}}} \cdot 124,667 + \frac{1}{17^{\frac{5}{2}}} 3033,333 \right) \right.$$

$\frac{1}{11,1805}$ $\frac{1}{70,0927}$

0,0142668	2,23007
0,0894414	2,~~54~~ 5648
0,0751746	~~641~~
0,0093968	~~0,51551~~
0,00197333	~~0,00197231 2~~
204580	4,77571
	0,0298481 8
	30944

$(1+4\xi)(x+1+2\xi-2(1+\xi)(1-\eta)$

$2+2\xi-2(1+\xi)$

$$-\frac{1}{1020^4\left(\left(1000^2+1020^2\right)-2.1020.980\right)^{\frac{3}{2}}}+\frac{1}{1020^4\left(\left(1000^2+1020^2\right)-2.1020.1000\right)^{\frac{3}{2}}}$$

$$-\frac{1}{1,08243216\ 10^{12}}\Big($$

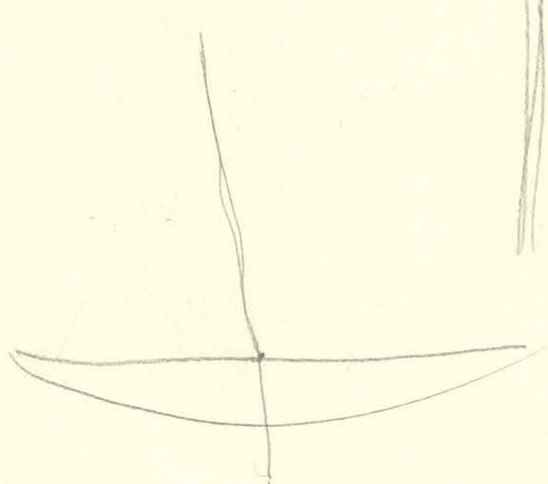
2,040400
1,999200
0041200

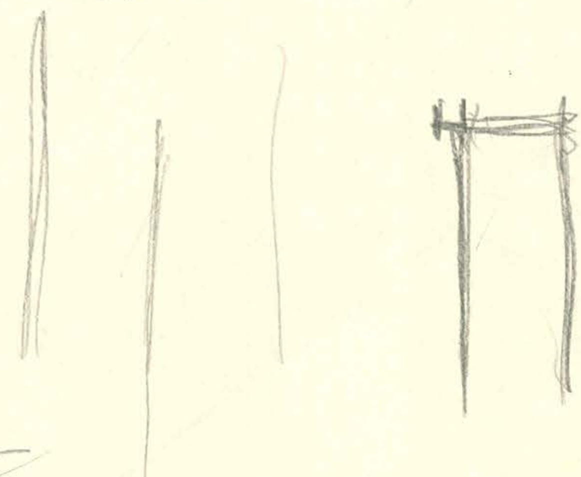
4,614897
2,307449
6,922347
0,07765 −7
0,11958 10^{-6}

2,040400
2,048000
400

2,602060
1,301030
3,903090
0,09691 −4
125,00 10^{-6}
12

$$+\frac{124,88}{1,08243}10^{-18}.\,3.10^{18}$$





$\frac{3}{c}(\lambda-\xi)$

$\frac{3}{c}\left((\lambda-\xi+1)\eta-\xi\eta+\eta\right)(\xi\lambda+1)$

$$\left(-\frac{24}{10000}\right)$$

$$-\frac{0{,}11958}{1{,}08243216}10^{-18}\cdot10^{18}\left(2+3\left(1+\frac{4}{100}\right)-6\left(1+\frac{2}{100}\right)\left(1-\frac{2}{100}\right)-3\left(1+\frac{6}{100}\right)\left(1-\frac{2}{100}\right)\right.$$

$$\left.+3\left(1+\frac{4}{100}\right)\left(1-\frac{4}{100}\right)+\left(1+\frac{6}{100}\right)\left(1-\frac{6}{100}\right)\right)$$

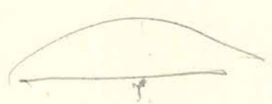
$$+\frac{125{,}00}{1{,}08243216}10^{-18}\cdot10^{18}\left(2+3\left(1+\frac{4}{100}\overset{+\frac{4}{10000}}{}\right)-6\left(1+\frac{2}{100}\right)-3\left(1+\frac{6}{100}\overset{+\frac{12}{10000}}{}\right)\right.$$

$$\left.+3\left(1+\frac{4}{100}\overset{+\frac{4}{10000}}{}\right)+\left(1+\frac{6}{100}\overset{+\frac{12}{10000}}{}\right)\right)$$

+12 −26
−+12
+12

n $\frac{n-1}{2}$

$(1+x)^3=1+3x+3x^2+x^3$



$(1+x)^4=1+4x+6x^2$ $+\cancel{\frac{12}{100}}+\frac{24}{10000}-\cancel{\frac{12}{100}}+\frac{36}{10000}-\frac{48}{10000}-\frac{36}{10000}$

1+6+

$1+\frac{6}{100}+$

+0,000265 +0,000822

$\left(1+\frac{4}{100}+\frac{4}{10000}\right)\left(1-\frac{4}{100}+\frac{4}{10000}\right)$ $\left(1+\frac{6}{100}+\frac{12}{10000}\right)\left(1-\frac{6}{100}+\frac{12}{10000}\right)\left(1-\frac{2}{100}\right)^4$

$(\overline{1000}^2+\overline{980}^2)-2\cdot\overline{980}^2$ | $\overline{1000}^2+\overline{980}^2-2\,980\cdot1000$

−24 +12
−36 +72
−36 +60

1000000
960400
39600

1960400
1960000

−24 ~~+72~~
−36 +60
−36

$$\frac{1}{980^4}\left\{\frac{10^{18}}{(39600)^{\frac{3}{2}}}\left(\cancel{2}+\cancel{3}\left(1-\frac{4}{100}\overset{+\frac{4}{10000}}{}\right)-\cancel{6}\left(1-\frac{4}{100}+\frac{4}{10000}\right)-\cancel{3}\left(1-\frac{6}{100}+\frac{12}{10000}\right)\left(1-\frac{2}{100}\right)\right.\right.$$

$$\left.+3\left(1-\frac{8}{100}+\frac{24}{10000}+\cancel{\frac{32}{10000}}\right)+\left(1-\frac{12}{100}+\frac{60}{10000}\right)\right)$$

about $\frac{1}{980^4}\left\{\frac{10^{18}}{(39600)^{\frac{3}{2}}}\frac{48}{10000}\right.$ ~~…~~ $\frac{10^{18}}{(200)^{\frac{5}{2}}}$ about k 0,002075

+12 −26
+12
+12

$$\cancel{2}+\cancel{3}\left(1-\cancel{\frac{4}{100}}+\frac{4}{10000}\right)-\cancel{6}\left(1-\frac{1}{100}\right)-\cancel{3}\left(1-\cancel{\frac{6}{100}}+\frac{12}{10000}\right)+3\left(1-\cancel{\frac{4}{100}}+\frac{4}{10000}\right)$$

$$+\left(\cancel{1}-\cancel{\frac{6}{100}}+\frac{12}{10000}\right)$$

+12 −24
+24 −12

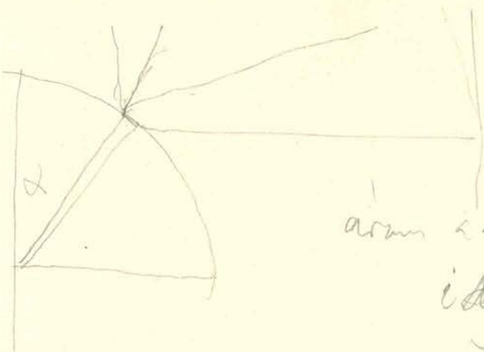
$$-\frac{0{,}11958}{1{,}08243216}\left(\cancel{2}+\cancel{3}\left(1+\cancel{\frac{4}{100}}+\frac{4}{10000}\right)-6\left(1-\frac{4}{10000}\right)-3\left(1+\cancel{\frac{6}{100}}+\frac{12}{10000}\right)\left(1-\frac{2}{100}\right)\right.$$

$$\left.+3\left(1-\frac{8}{10000}\right)+\left(\cancel{1}-\frac{12}{10000}\right)\right)$$

2,991226

1,681241
0,497150
2,178391
4,861448 2
0,316943 −3

4,597695
2,298848
6,896544
11,964904
3,861448



$y = r \sin\alpha$

$dy = r\cos\alpha \, d\alpha$

áram á[illegible]

$i\,dy$ áram

$$\frac{i\,dy}{r\,d\alpha \sin\alpha + 2\rho \sin 2\alpha\, d\alpha}$$

$\frac{\pi}{2} + \alpha - 2\alpha$

$\pi - 2\alpha \quad \frac{\pi}{2} - \alpha$

$\frac{\pi}{2} - \alpha$

$$\frac{i \cdot r\cos\alpha \cdot \sin 2\alpha}{r \sin\alpha + 2\rho \sin 2\alpha}$$

$\cos 2\alpha - \frac{\pi}{2}$

$\rho = y - r\cos 2\alpha$

$\cancel{y = \rho \sin\alpha}$

$$i\,\frac{r\cos\alpha \sin 2\alpha}{r\sin\alpha + 2(y - r\cos 2\alpha)\sin 2\alpha}$$

$\alpha + \frac{\pi}{2}$

$$\frac{i\, r\cos\alpha \sin 2\alpha}{r\sin\alpha + 2(\rho\sin\alpha - r\cos 2\alpha)\sin 2\alpha}$$

$$\left(\frac{i\,\frac{r}{2}\cos^3\alpha}{r + 2\rho\sin 2\alpha - r\cos 2\alpha\cos\alpha}\right)\frac{C}{(\rho^2 + c^2)}\,\rho\,d\rho\, d\alpha \sin\alpha$$

$$\frac{C}{(\rho^2 + c^2)^3}\,\rho\,dr\,d\alpha\cos\alpha$$

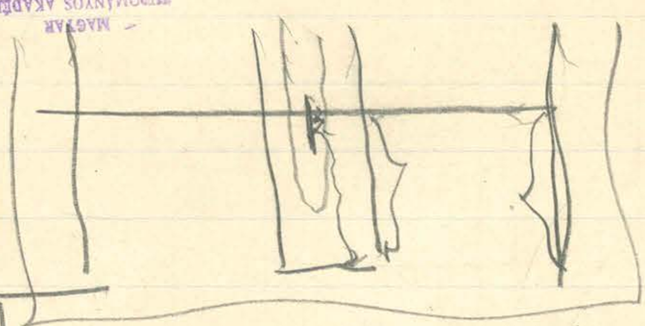
$$\frac{y}{i\,x\,dz} = 2\,\mathrm{arctg}\frac{a(b-y)}{c\sqrt{a^2+c^2+(b-y)^2}} + 2\,\mathrm{arctg}\frac{a(b+y)}{c\sqrt{a^2+c^2+(b+y)^2}}$$

$$2\,\frac{1}{1+\dfrac{a^2b^2}{c^2(a^2+b^2+c^2)}}\left\{-\frac{ab}{c\sqrt{(a^2+b^2+c^2)}}\left(+\frac{ab^2}{c\sqrt{(a^2+b^2+c^2)}^{\frac{3}{2}}}\right.\right.$$

$$+\frac{a}{c\sqrt{a^2+b^2+c^2}}$$

$2\cos 2\alpha\, d\alpha$

$r\,d\alpha\cos\alpha + 2\varrho\cos 2\alpha\, d\alpha$.



$\cancel{dy}\ \ \Delta y\ i$

$$\boxed{\cancel{\Delta y} + 2\varrho\frac{\cos 2\alpha}{R\cos\alpha}\cancel{\Delta y}}$$

$$\varrho = R\sin\alpha$$

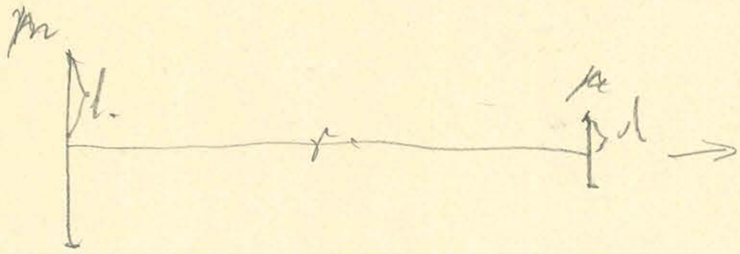
$$i_x = \frac{i}{1+2\varrho\frac{\cos 2\alpha}{\cos\alpha}}\sin\frac{\alpha}{2}$$

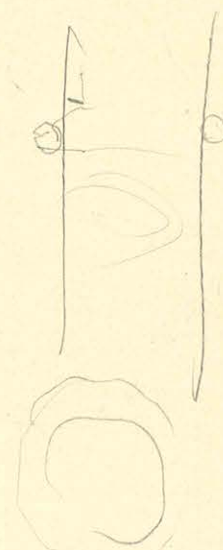
$$\varrho = (y - R\sin\alpha)\sin 2\alpha.$$

$$i_x = \frac{i\sin\frac{\alpha}{2}}{1+\frac{(y-R\sin\alpha)}{R}\frac{\sin 4\alpha}{\cos\alpha}}$$

$$\mathrm{tg}\,\alpha = \frac{x}{y}.$$

$45°c_2 \left(0{,}96572 \times 3\frac{MM'}{r^4} \right)$





$$2\frac{m\mu r}{\left(r^2+(l-\lambda)^2\right)^{\frac{3}{2}}} - 2\frac{m\mu r}{\left(r^2+(l+\lambda)^2\right)^{\frac{3}{2}}}$$

$$\frac{2m\mu}{r^2\left(1+\left(\frac{l-\lambda}{r}\right)^2\right)^{\frac{3}{2}}} - \frac{2m\mu}{r^2\left(1+\left(\frac{l+\lambda}{r}\right)^2\right)^{\frac{3}{2}}}$$

$$\frac{2m\mu}{r^2}\left\{1-\frac{3}{2}\left(\frac{l-\lambda}{r}\right)^2 - 1 + \frac{3}{2}\left(\frac{l+\lambda}{r}\right)^2\right\}$$

$$\frac{2m\mu}{r^2}\left\{\frac{6l\lambda}{r^2}\right. \qquad \frac{3.MM'}{r^4}$$

$$3\frac{MM'}{r^4}\left\{\frac{M.r^2}{6l\lambda}\left(\frac{1}{\left(1+\left(\frac{l-\lambda}{r}\right)^2\right)^{\frac{3}{2}}} - \frac{1}{\left(1+\left(\frac{l+\lambda}{r}\right)^2\right)^{\frac{3}{2}}}\right)\right.$$

$45 \quad l=5 \quad \lambda=2 \qquad \frac{49}{2025}$

$$\frac{2025}{60}\left(\frac{1}{(1{,}004444)^{\frac{3}{2}}} - \frac{1}{(1{,}0241975)^{\frac{3}{2}}}\right)$$

0,001924 — 0,010385

0,00577² — 0,031155

$3\frac{MM'}{r^4}$ 0,9657225 — 0,002886 — 0,015578

0,997114 −1 — 0,984422 −1

$$\begin{array}{r} 0{,}993378 \\ 964764 \\ \hline 0{,}028614 \end{array}$$

57,94335

~~4596~~. x = 19,05 x

4608	= 19,05 x
4338	= 17,95 x
4025	= 16,60 x
3323	= 13,65 x
2780	= 11,45 x
1922	= 7,80 x
1363	= 5,60 x

[aa] = + 13702900

33244485

4622	4550	+ 14
4355	4283	+ 17
4027	3955	− 8
3311	3239	− 12
2778	2706	− 2
1892	1820	− 30
1359	1287	+ 4

2426.

$+2l.$ $+\sqrt{(a^2+b^2)}\,\mathrm{arc\,tg}\frac{c-l}{\sqrt{a^2+b^2}} - \sqrt{a^2+b^2}\,\mathrm{arc\,tg}\frac{c+l}{\sqrt{a^2+b^2}} = \sqrt{a^2+b^2}\,\mathrm{arc\,tg}\frac{-2l}{\sqrt{a^2+b^2}}\,\frac{1}{1+\frac{c^2-l^2}{a^2+b^2}}$

$$-\frac{2l\sqrt{a^2+b^2}}{a^2+b^2+c^2-l^2}$$

$+2l.$

$$2l. \quad -2l\,\frac{a^2+b^2}{a^2+b^2+c^2}$$

$$2l - \sqrt{a^2+b^2}\,\mathrm{arc\,tg}\frac{2l\sqrt{a^2+b^2}}{a^2+b^2+c^2-l^2}$$

$$2l - \frac{2l(a^2+b^2)}{a^2+b^2+c^2\cancel{-l^2}}$$

$$2l - \frac{2l(a^2+b^2+c^2)}{a^2+b^2+c^2} + \frac{2lc^2}{a^2+b^2+c^2}$$

$\log y = 2\,\mathrm{arc\,tg}\frac{y-1}{y+1}$

$\frac{y-1}{y+1} = x$

$y-1 = x(y+1)$

$y - xy = x+1$

4,027064
4,025715
4,021644
4,021437
4,021768
4,023335
4,025019
4,027146
4,032941
4,081023

2,013532
3,954243
0,005567
5,973342
6,814208
0,159134 −1
0,14426

2,012857
3,954243
0,004278
5,971378
6,790032
0,181346 −1
0,15183

2,010822
3,954243
0,000217
5,965282
6,708710
0,256572
0,18054

2,010719
3,954243

5,964962
6,704442
0,260520
0,18219

2,010884
3,954243
0,000347
5,965474
6,711377
9254097
0,17951

2,011668
3,954243
0,001907
5,967818
6,744324
0,223494
0,16730

2,012510
3,954243
0,003547
5,970300
6,776607
0,193693
0,15620

2,013573
3,954243
0,005652
5,973468
6,815890
0,157578
0,14374

2,016471
3,954243
0,011232
5,981946
6,908876
0,073070 −1
0,11832

2,040512
3,954243
0,052386
6,047141
7,374290
0,672851 −2
0,04708

10506,25

$c-2$	$(c-2)^2$	$a^2+b^2+(c-2)^2$	{ }	$\sqrt{a^2+b^2+(c-2)^2}$		
11,7	136,89	10643	1,01286	1456920	5062500	6519420
10,2	104,04	10610	1,00987	1103864		6166364
2,2	4,84	10511	1,00046	50873		5113373
0,3	0,09	10506	1,00001	946		5063446
2,8	7,84	10514	1,00075	82430		5144930
6,8	46,24	10552	1,00438	487924		5550424
9,3	86,49	10593	1,00817	916189		5978689
11,8	139,24	10645	1,01308	1482210		6544710
16,8	282,24	10788	1,02616	3044805		8107305
39,3	1544,49	12051	1,12876	18612649		23675149

193,14
160,29
61,09
56,34
64,09
102,49
142,74
195,49
338,49
1600,74

2,285872 6,757616 2,204906 6,614718 1,785970 5,357910 1,750817 5,252451 1,806790 5,420370

2,051114 6,153342 ~~0,010686~~ 6,032058 2,154546 6,463638 2,291125 6,873375 2,529546 7,588638 3,204310 9,612930

0,497150
0,301030
1,750123
2,548303

2,548303
4,033817
0,514486−2
0,032695

2,548303
4,462658
0,085645−2
0,012180

2,548303
3,378808
0,169495−1
0,14773

2,548303
3307359
0,240944−1
0,17416

2,548303
2,678955
0,869348−1
0,74020

2,548303
2,626226
0,922077−1
0,83575

2,548303
2,710185
0,838118−1
0,68884

2,548303
3,016029
~~3,076671~~
~~0,471632−1~~
0,532274−1
~~0,29623~~
0,3406

2,548303
3,231819
0,316484−1
0,20724

2,548303
3,436688
0,111615−1
0,12931

2,548303
3,794319
0,753984−2
0,05675

2,548303
4,806465
0,741838−3
0,00552

432,64 488,89 2,689211 8,067633
888,04 944,29 2,975105 8,925315