Ms 5101/9-10 Eötvös Loránd jegyzeti. Magnesség

1910 december 24. éjjel.
Sarok mágneses szobában.

1910–1911 évekba

Sitávos eszköz érzékenységének meghatározása a 2080 cgs momentumu mágnessel.

Horizontális mágnessor befüggesztve. Eszköz az I állásban. Kitérítő mágnes távola a belső mágnestől: 134,0 cm.; magassága a föld felett: 45,7 cm.

I állás Mágnes meridián.

Idő	Kitérítő m. eltávolitva	É. polus északon	D. polus északon
1h. 50m.	194,7		
2h. 0m.	193,3		
10m.	193,2		
40m		298,8	
50m		300,1	
3h. 0m.		299,9	
30m.			78,7
40m.			76,0
50m.			76,0
4h 20m		301,8	
30m.		300,7	
40m		300,1	
5h. 20m.			75,2
40m			74,9
6h 25m	191,0		
40 m	190,8		
50 m	191,0		
7h 55 m	190,8		
9h 5	190,8		

} Kívül a szomszédban lakásban, befűtve, egy [illegible] (note beside the 7h 55m reading)

[illegible]

11h. 50m. 190,8

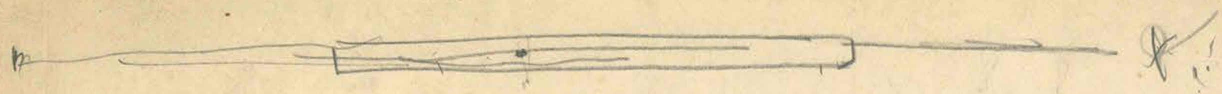
[illegible]

1910. deczember 17. d.e.
Iroda melletti szobában.

Érzékenység meghatározás a 2080 momentumu mágnessel.

Mágnes két helyzetének egymástól való távola: 208,3 cm. Mágnes középpontjának a föld felett való magassága 19,0 cm. Eszköz a III állásban. Főkör: 165°0'.

Idő		Külső mágnes eltávolítva Torzió kör.	Leolvasás	Külső m. nyugaton Torziók.	Leolvasás	Külső m. keleten Torzió k.	Leolvasás
10h. 40m.		322°0'	153,1				
11h. 0m.		"	146,2				
10m.		"	155,5				
45m.	északi polus lefelé			334°0'	162,0		
12h. 0m.	" " "			"	176,0		
20m	" " "			333°20'	134,0		
30m	" " "			"	133,0		
1h. 15m.	déli polus lefelé			310°0'	115,7		
25m	" " "			"	115,0		
2h 20m				311°0'	201,7		
2h 30m				"	202,4		
3h. 0m.	északi polus lefelé					310°0'	157,0
10m	" " "					"	159,2
30m.	" " "					309°40'	137,0
40m.	" " "					"	139,3
4h. 10m.	déli polus lefelé					334°0'	158,0
20m.	" " "					"	157,2
40m.	" " "					333°40'	128,2
5h. 0m.	" " "					"	128,0



$\alpha \quad \beta \quad \gamma \qquad c=0$

$\frac{\partial^2 U}{\partial x \partial z}$ ~~Mágnesség mérések~~

$C=0. \qquad x, y = 0 \quad z=0.$

$$\frac{\partial^2 V}{\partial x \partial z} = \left(+\left(\frac{12}{r^5} - 15\frac{b^2}{r^7}\right)\int \alpha \xi \, d\tau - \left(\frac{90 b}{r^7} - \frac{105 b^3}{r^9}\right)\int \alpha \eta \xi \, d\tau - \left(\frac{60 a}{r^7} - \frac{105 a b^2}{r^9}\right)\int \alpha \xi \xi \, d\tau\right.$$

$$+ 15\frac{ab}{r^7}\int \beta \xi \, d\tau - \left(\frac{90 a}{r^7} - \frac{105 a^3}{r^9}\right)\int \beta \eta \xi \, d\tau - \left(\frac{90 b}{r^7} - \frac{105 b^3}{r^9}\right)\int \beta \xi \xi \, d\tau$$

$$- 3\frac{a}{r^5}\int \gamma \, d\tau + \left(\frac{12}{r^5} - \frac{15 b^2}{r^7}\right)\int \gamma \xi \, d\tau + \frac{15 ab}{r^7}\int \gamma \eta \, d\tau$$

$$-\left(60\frac{a}{r^7} - 105\frac{ab^2}{r^9}\right)\int \gamma \xi^2 \, d\tau - \left(90\frac{a}{r^7} - 105\frac{a^3}{r^9}\right)\int \gamma \eta^2 \, d\tau + 45\frac{a}{r^7}\int \gamma \xi^2 \, d\tau$$

$$-\left(\frac{90 b}{r^7} - 105\frac{b^3}{r^9}\right)\int \gamma \xi \eta \, d\tau$$

	felül $\lambda=0$	$\lambda=\frac{\pi}{2}$	$\lambda=\pi$	$\lambda=3\frac{\pi}{2}$
$\lambda=0$	$\int \alpha \xi \, d\tau$	$-\int \beta \xi \, d\tau$	$-\int \alpha \xi \, d\tau$	$+\int \beta \xi \, d\tau$
	$\int \alpha \xi \xi \, d\tau$	$+\int \beta \eta \xi \, d\tau$	$+\int \alpha \xi \xi \, d\tau$	$+\int \beta \eta \xi \, d\tau$
	$\int \beta \eta \xi \, d\tau$	$+\int \alpha \xi \xi \, d\tau$	$+\int \beta \eta \xi \, d\tau$	$+\int \alpha \xi \xi \, d\tau$
	$\int \gamma \, d\tau$	$\int \gamma \, d\tau$	$\int \gamma \, d\tau$	$\int \gamma \, d\tau$
	$\int \gamma \xi \, d\tau$	$-\int \gamma \eta \, d\tau$	$-\int \gamma \xi \, d\tau$	$+\int \gamma \eta \, d\tau$
	$\int \gamma \xi^2 \, d\tau$	$+\int \gamma \eta^2 \, d\tau$	$+\int \gamma \xi^2 \, d\tau$	$+\int \gamma \eta^2 \, d\tau$
	$\int \gamma \eta^2 \, d\tau$	$+\int \gamma \xi^2 \, d\tau$	$+\int \gamma \eta^2 \, \tau$	$+\int \gamma \xi^2 \, d\tau$
	$\int \gamma \xi^2 \, d\tau$	$+\int \gamma \xi^2 \, d\tau$	$+\int \gamma \xi^2 \, d\tau$	$+\int \gamma \xi^2 \, d\tau$

Első mágneses nota. 1911. szeptember.

Olasz eszköz

Nap	Óra	Állí	Főkör	Leolvasások 1.	2.	t_1	t_2

Olasz eszköz.

Desanetálva 1911. szept. 18. d.e. 10h kor.

Nap	Óra	Állí	Főkör	1.	2.	t_1	t_2
Szept. 18.	11h 0m	T	123°0'	173,1	423,05	20,1	20,1
	12h 30	"	–	173,25	423,3	20,3	20,3
	1h 30			173,5	423,1	20,7	20,7
	2h 30			173,5	423,0	20,8	20,8
	4h 0m			173,7	422,8	20,8	20,8
	6h 0m			173,75	422,8	20,8	20,8
	7h 0m			173,9	422,75	20,7	20,7
				1			
Szept. 19. r.	7h 30m			173,9	422,9	20,1	
	9h 0m			173,9	423,1.	20,1	
	10h 30			173,85	423,15	20,2	
	1h 30m			173,75	423,15	20,7	
	3h 0m			173,8	423,05	20,8	
	4h 0m			173,85	422,9	20,9	
	5h 30			173,9	422,9	20,9	
Szept. 20	r. 8h 40m			173,85	422,95	20,1	
	12h 40m			173,85	423,0	20,5	
	3h 0m			173,8	423,0	20,6	
Szept. 21	r. 8h 30m			173,9	422,9	20,0	
	12h 45			173,7	423,3	20,6	

Olasz eszköz 1911. augustus. Leolvasások.

Nap	Óra	Főkör	Golyó távol	Golyó északon	Golyó délen	Temperaturák	Különbségek		

Az „Olasz eszköz" csavarási állandóinak meghatározása. a 13130 gr. tömegű ólomsullyal.

I eszköz

Nap	Óra	Főkör	távol	északon	délen	Temperaturák	Különbségek		
aug. 9.	7h 0m	18°0'	148,2			26,5			
	45m			127,15		26,5			
	8h 30m				168,10	26,4	40,925	−0,00	0
	9h 15m			127,20		26,4	40,825	−0,10	100
	10h 0m				167,95	26,4	40,775	−0,15	225
	45m			127,15		26,4	40,875	−0,05	25
	11h 30m				168,10	26,3	40,950	+0,02	4
aug. 10.	12h 15m			127,15		26,2	40,950	+0,02	4
	1h 0m				168,10	26,1	41,000	+0,07	49
	45m			127,05		26,1	41,050	+0,12	144
	2h 30m				168,10	26,0	41,025	+0,10	100
	3h 15m			127,1		26,0	40,950	+0,02	4
	4h 0m				168,00	26,0	40,9325		655
	45m		148,2			26,0			

II eszköz

Nap	Óra	Főkör	távol	északon	délen	Temperaturák	Különbségek
aug 10	7h 0m	198°0'	444,2			26,6	
	45m			423,65		26,5	
	8h 30m				464,05	26,5	40,425
	9h 15m			423,60		26,5	40,450
	10h 0m				464,05	26,5	40,450
	45m			423,60		26,5	40,450
	11h 30m				464,05	26,5	40,400
aug 11.	12h 15m			423,70		26,5	40,375
	1h 0m				464,10	26,4	40,450
	45m			423,60		26,4	40,500
	2h 30m				464,10	26,3	40,525
	3h 15m			423,55		26,3	40,550
	4h 0m				464,10	26,3	40,4575
	45m		444,25			26,3	

1912 Március 29iki rendezésnél
eltett Vegyesek.

$$\frac{\partial V}{\partial a} = \frac{2\pi J n}{l}\left[-\cancel{l}\left[r^2+(l-a)^2\right]^{-\frac{1}{2}} + \frac{1}{2}(l-a)\left(r^2+(l-a)^2\right)^{-\frac{3}{2}} 2(l-a)\right.$$

$$\left. + (r^2+a^2)^{-\frac{1}{2}} - \frac{a}{2}(r^2+a^2)^{-\frac{3}{2}} 2a\right]$$

$$= \frac{2\pi J n}{l}\left(-\cancel{l}\left(r^2+(l-a)^2\right)^{-\frac{1}{2}} + (l-a)^2\left(r^2+(l-a)^2\right)^{-\frac{3}{2}}\right.$$

$$\left. + (r^2+a^2)^{-\frac{1}{2}} - a^2(r^2+a^2)^{-\frac{3}{2}}\right)$$

$$\frac{\partial V}{\partial a} = \frac{2\pi J n}{l}\left[\frac{-\cancel{l}}{(r^2+(l-a)^2)^{\frac{1}{2}}} + \frac{(l-a)^2}{(r^2+(l-a)^2)^{3/2}}\right.$$

$$\left. + \frac{1}{(r^2+a^2)^{\frac{1}{2}}} - \frac{a^2}{(r^2+a^2)^{\frac{3}{2}}}\right]$$

$$\left[\frac{-r^2}{(r^2+(l-a)^2)^{\frac{3}{2}}} + \frac{r^2}{(r^2+a^2)^{\frac{3}{2}}}\right].$$

$a=0$

$- \cancel{r^4}\ 3$

$$+\frac{3}{2}\frac{r^2}{(r^2+(l-a)^2)^{\frac{5}{2}}} r^2\ 2(l-a)$$

$$* -\frac{3}{2}\frac{r^2\ 2a}{(r^2+a^2)^{\frac{5}{2}}}$$

$$\frac{-r^2}{(r^2+l^2)^{\frac{3}{2}}} + \frac{1}{r}$$

$$1 = \frac{2.\pi.174.1671.7\ J}{457}$$

$J = 0{\cdot}02392$

$l-a$	$(l-a)^2$	r^2	$(l-a)^2+r^2$	$((l-a)^2+r^2)^{\frac{1}{2}}$	r^2+a^2	$(r^2+a^2)^{\frac{1}{2}}$	$\frac{l-a}{(\ )}$	$\frac{a}{(\ )}$	Σ
43.7	1909.69	28.89	1938.58	44.0	28.89	5.4	0.9932	0	0.9932
42.7	1823.29	〃	1852.18	43.0	29.89	5.5	0.9930	0.1818	1.1748
41.7	1738.89	〃	1767.78	42.0	32.89	5.7	0.9929	0.3508	1.3437
40.7	1656.49	〃	1685.38	41.1	37.89	6.1	0.9902	0.4918	1.4820
39.7	1576.09	〃	1604.98	40.1	44.89	6.7	0.9900	0.5970	1.5870
38.7	1497.69	〃	1526.58	39.1	53.89	7.3	0.9897	0.6849	1.6746
37.7	1421.29	〃	1450.18	38.1	64.89	8.1	0.9894	0.7407	1.7301
36.7	1346.89	〃	1375.78	37.1	77.89	8.8	0.9892	0.7954	1.7846
35.7	1274.49	〃	1303.38	36.1	92.89	9.6	0.9889	0.8333	1.8222
34.7	1204.09	〃	1232.98	35.1	109.89	10.5	0.9886	0.8571	1.8457
33.7	1135.69	〃	1164.58	34.1	128.89	11.4	0.9883	0.8772	1.8855
						Kotéjen			1.9409

33·7

28·89
1135·69
$\sqrt{1164·58} = 34·12$
264 : 64·4
858 : 681.1
17700 : 682

28·89
100
$\sqrt{128·89} = 11·35$
28 : 21.1
789 : 220.0
12000 : 226

$\frac{33·7}{34·12}$

$\frac{33·7}{34·12} + \frac{10}{11·35}$

0 0·9925
5 1·6717
10 1·8687

0·9877
0·8810
1·8687

0·9925
97046

Kitejun 1·9409

$\frac{l}{2}\left(\frac{4r^2+l^2}{4}\right)^{\frac{1}{2}} + \frac{l}{2}\left(\frac{4r^2+l^2}{4}\right)^{\frac{1}{2}}$

$1 = \frac{2\pi n J}{l}$ 1·6717

$\frac{\frac{l}{2}}{\left(\frac{4r^2+l^2}{4}\right)^{\frac{1}{2}}} + \frac{\frac{l}{2}}{\left(\frac{4r^2+l^2}{4}\right)^{\frac{1}{2}}}$

$\sqrt{1526·58} = 29·07$
626·699
558 : 78
55800 : 780

$\frac{2l}{4r^2+l^2}$

$-\frac{\frac{l}{2}}{\frac{4r^2+l^2}{4}} + \frac{\frac{3l}{2}}{r^2+9l^2}$

0·9905
6812
16717

~~21·9~~
25·00
28·89
$\sqrt{53·89} =$ ~~7·03~~ 7·34
489 : 1400
~~4889 : 140~~
6000 : 146

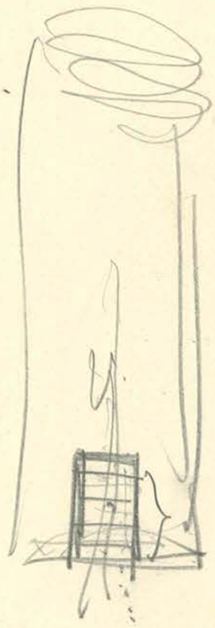
$\frac{5}{7·34}$

$\frac{38·7}{l^2+38·7^2}$

3

28·89
1497·69
28·89
$\sqrt{1526·58} = 36·69$
~~626 : 966~~
~~5058~~ : 7266
702

346 / 42,7 / 12,63
246
9 10
692
2180
2076
1 0 4 0



10.

$l = 43.7$

$r = 10.75$

Methode von $V = 1$

5.375.5.375

$\frac{\partial l}{\partial r} =$

$$V = \frac{2 J \pi n}{l} \left(\frac{l-a}{(r^2+(l-a)^2)^{\frac{1}{2}}} + \frac{a}{(r^2+a^2)^{\frac{1}{2}}} \right)$$

$$V = \frac{2\pi J n}{l} \left[(l-a)(r^2+(l-a)^2)^{-\frac{1}{2}} + a(r^2+a^2)^{-\frac{1}{2}} \right]$$

$$V_0 = \frac{2\pi n J}{l} \frac{l}{\sqrt{l^2+r^2}} = \frac{2\pi n J}{l} \frac{43.7}{44.03}$$

$$V_{10} \quad \frac{2\pi n J}{l} \left(\frac{l-10}{(r^2+(l-10)^2)^{\frac{1}{2}}} + \frac{10}{(r^2+100)^{\frac{1}{2}}} \right)$$

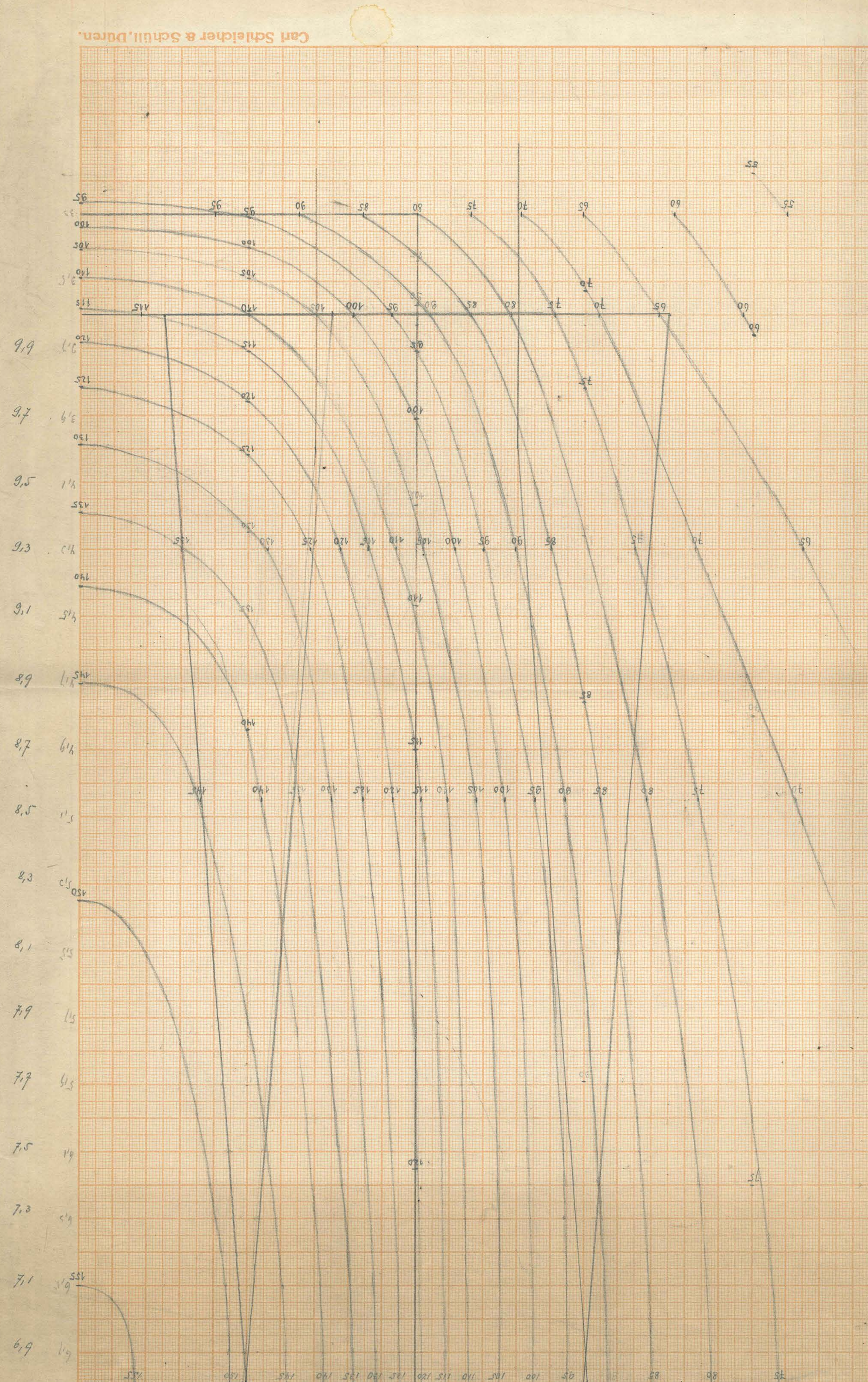
$$\frac{43.7}{(43.7^2+10.75^2)^{\frac{1}{2}}}$$

~~1909.7~~
1909.69
115.56
$\sqrt{2025.25} = 45.03$
425.85.5
00 2500 : 90

~~1909.69~~

1909.69
28.89
$\sqrt{1938.58} = 44.03$
338.84.4
258.00 880

Ad) Lemerspalwadij



~~$\rho \sin\alpha \cos\alpha \,\Delta\alpha$~~ dz

~~$\rho\Delta\alpha$~~

$$d\mu \; \frac{\Delta f \rho \cos\alpha \,\Delta\alpha\, dz \;\rho \sin\alpha}{(\rho^2 \sin^2\alpha + z^2)} \rho\cos\alpha .$$

$\frac{240}{240 \cdot 1}$ $\quad 2640 \; 10^{-4}$

$+9 \quad 2904000 \; 10^{-8}$

$0{,}2640$

$9{,}929040$

$0{,}0292389$

$$d\mu = f \Delta\alpha \, \rho^3 \frac{\cos^2\alpha \sin\alpha \, d\alpha \, dz}{(\rho^2 \sin^2\alpha + z^2)}$$

$\alpha - \alpha^3 d\alpha$

$1 - \alpha^2$

$$d\mu = f \rho^3 \frac{\cos^2\alpha \sin\alpha \, d\alpha \, dz}{(\rho^2 \sin^2\alpha + z^2)}$$

$\frac{\alpha_0 \Delta\alpha}{2}$

$$\alpha' \; \left(\alpha_0 + \frac{\Delta\alpha}{2}\right)^2 \; \left(\alpha_0 - \frac{\Delta\alpha}{2}\right)$$

$$\alpha_0^2 + \left(\frac{\Delta\alpha}{2}\right)^2$$

$$d\mu = f \rho^3 dz \left\{ \int \frac{\alpha \, d\alpha}{\rho^2 \alpha^2 + z^2} - \int \frac{\alpha^3 d\alpha}{\rho^2 \alpha^2 + z^2} \right\}$$

$$d\mu = f \rho^2 dz \left\{ \frac{1}{2\rho^2} \log(\rho^2\alpha^2 + z^2) + \frac{\alpha^2}{2\rho^2} - \frac{z^2}{\rho^2} \frac{1}{2\rho^2} \log(\rho^2\alpha^2 + z^2) \right\}$$

~~$\Delta\alpha$~~. ρ'

$$d\mu = f \rho^2 dz \left\{ \frac{\alpha'^2 - \alpha^2}{2\rho^2} + \frac{1}{2\rho^2}\left(1 - \frac{z^2}{\rho^2}\right) \log \frac{z^2 + \rho^2 \alpha'^2}{z^2 + \rho^2 \alpha^2} \right\}$$

$$d\mu = f \rho^2 dz \left\{ \frac{\alpha_0 \Delta\alpha}{\rho^2} + \frac{1}{2\rho^2}\left(1 - \frac{z^2}{\rho^2}\right) \log \frac{z^2 + \rho^2\alpha_0^2 + \rho^2\left(\frac{\Delta\alpha}{2}\right)^2 + \rho^2 \alpha_0 \Delta\alpha}{z^2 + \rho^2\alpha_0^2 + \rho^2\left(\frac{\Delta\alpha}{2}\right)^2 - \rho^2 \alpha_0 \Delta\alpha} \right\}$$

$$2 \frac{\rho^2 \alpha_0 \Delta\alpha}{z^2 + \rho^2 \alpha_0^2 + \rho^2 \left(\frac{\Delta\alpha}{2}\right)^2} + \frac{2}{3}\left(\quad\right)^3 + \frac{2}{5}\left(\quad\right)^5 + .$$

$A = r_1 a_1 + r_2 a_2 + r_3 a_3 + r_4 a_4$

$B = r_2 a_1 + r_3 a_2 + r_4 a_3 + r_1 a_4$

$C = r_3 a_1 + r_4 a_2 + r_1 a_3 + r_2 a_4$

$D = r_4 a_1 + r_1 a_2 + r_2 a_3 + r_3 a_4$.

jó

$$a_1 = \frac{A\{2r_2^2 - r_1(r_1+r_3)\} + (B+D) r_2(r_1-r_3) - C\{2r_2^2 - r_3(r_1+r_3)\}}{(r_1-r_3)\{4r_2^2-(r_1+r_3)^2\}}$$

$$a_1 = \frac{(A-C)(2r_2^2-(r_1^2-r_3^2)) + (B+D) r_2 (r_1-r_3)}{(r_1-r_3)\{4r_2^2-(r_1+r_3)^2\}}$$

$$a_2 = \frac{(D-B)(2r_2^2-(r_1^2-r_3^2)) + (A+C) r_2(r_1-r_3)}{(r_1-r_3)\{4r_2^2-(r_1+r_3)^2\}}$$

$$a_3 = \frac{-(A-C)(2r_2^2-(r_1^2-r_3^2)) + (B+D) r_2(r_1-r_3)}{\text{Nevező}}$$

$$a_4 = \frac{-(D-B)(2r_2^2-(r_1^2-r_3^2)) + (A+C) r_2(r_1-r_3)}{\text{Nevező}}$$

$$r_1 = -\frac{3}{\left(a+\frac{4\sqrt{2}}{3\pi}R\right)^4} \qquad r_2 = -3\frac{a}{\left(a^2+\frac{32}{9\pi^2}R^2\right)^{\frac{5}{2}}} \qquad r_3 = -\frac{3}{\left(a-\frac{4\sqrt{2}}{3\pi}R\right)^4}.$$

$a = 18$ $R = 5,5$ cm

$r_1 = -14,572 . 10^{-6}$ $r_2 = -26,309 . 10^{-6}$ $r_3 = -64,264 . 10^{-6}$

$A = -70$ $B = -68$ $C = -94$ $D = -103$

$a_1 = \frac{+127243 + 223557}{-171262} = -2048324$

$a_2 = \frac{-185563 + 214405}{-} = -168409$ (185563)

$a_3 = \frac{\pm 127243 \mp 223557}{-} = -562378$

$a_4 = \frac{+185563 \mp 214405}{-} = -2335416$.

$$-k\frac{d\mu}{3}\frac{1}{\varrho}\Bigg\{\frac{\varrho^2\cos^2(a-\alpha)-\varrho r\cos(a-\alpha)}{\sqrt{\varrho^4\sin^4(a-\alpha)-\big(r^2+\varrho^2-2r\varrho\cos(a-\alpha)\big)\varrho^2\sin^2(a-\alpha)}}\log\frac{\varrho^2\sin^2(a-\alpha)\sqrt{r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2}+(z-\zeta)\sqrt{\varrho^4\sin^4(a-\alpha)-\big(r^2+\varrho^2-2r\varrho\cos(a-\alpha)\big)\varrho^2\sin^2(a-\alpha)}}{\sqrt{\varrho^2\sin^2(a-\alpha)+(z-\zeta)^2}}$$

$$+\log\Big\{(z-\zeta)+\sqrt{r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2}\Big\}\Bigg\}$$

$$-k\frac{d\mu}{3}\frac{1}{\varrho}\iiint\Bigg\{\frac{\varrho^2\cos^2(a-\alpha)-\varrho r\cos(a-\alpha)}{\sqrt{\varrho^2\sin^2(a-\alpha)\big(r^2+\varrho^2\cos^2(a-\alpha)-2r\varrho\cos(a-\alpha)\big)}}\operatorname{arctg}\frac{(z-\zeta)\sqrt{\varrho^2\sin^2(a-\alpha)\big(r^2+\varrho^2\cos^2(a-\alpha)-2r\varrho\cos(a-\alpha)\big)}}{\varrho^2\sin^2(a-\alpha)\sqrt{r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2}}$$

$$+\log\Big\{(z-\zeta)+\sqrt{r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2}\Big\}\Bigg\}$$

$$\bar{F}=-k\frac{d\mu}{3}\iiint\Bigg\{\frac{1}{tg(a-\alpha)}\operatorname{arctg}\frac{\big(r-\varrho\cos(a-\alpha)\big)(z-\zeta)}{\varrho\sin(a-\alpha)\sqrt{r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2}}+\log\Big\{(z-\zeta)+\sqrt{r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2}\Big\}\Bigg\}$$

Csütörtök este.

$-\cos(a-\alpha) = x$

$\sin(a-\alpha)\, da = dx$

$$\iint \varrho\, d\mu \frac{r^2 dr \sin(a-\alpha)\, da\, dz}{\left(r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\xi)^2\right)^{\frac{5}{2}}}$$

$$k\, d\mu \frac{1}{3} \frac{r^2 dr\, dz}{\varrho} \Bigg| \frac{1}{\left(r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\xi)^2\right)^{\frac{3}{2}}}$$

$\frac{9\,000\,000}{146.641}$ 10^{6} 10^{4}

$$\frac{1}{3} \frac{k\, d\mu}{\varrho} dr \Bigg\| \frac{z-z}{\left(r^2+\varrho^2-2r\varrho\cos(a-\alpha)\right)} \frac{1}{\sqrt{}}$$

$$k\, d\mu \frac{1}{3} \frac{dz}{\varrho} \Bigg\| -\frac{\varrho^2 + (z-\xi)^2 - \varrho\cos(a-\alpha)\, r}{\varrho^2+(z-\xi)^2-\varrho^2\cos^2(a-\alpha)} \frac{1}{X^{\frac{1}{2}}}$$

$$-k\, d\mu \frac{1}{3} \frac{1}{\varrho} \Bigg\| \frac{\varrho^2-\varrho\cos(a-\alpha)\, r}{\left[\varrho^2-\varrho^2\cos^2(a-\alpha)\right]+(z-\xi)^2} \cdot \frac{dz}{X^{\frac{1}{2}}} - k\, d\mu \frac{1}{3} \frac{1}{\varrho} \Bigg\| \frac{(z-\xi)^2 dz}{\left[\varrho^2-\varrho^2\cos^2(a-\alpha)\right]+(z-\xi)^2} \frac{1}{X^{\frac{1}{2}}}$$

Ké enkű 2 cső Duna 450 klo.
1 cső 180 kilom.

$$F = \frac{u}{v}$$

$$\frac{\partial F}{\partial a} = \frac{u'v - v'u}{v^2}$$

$$\frac{\partial^2 F}{\partial a^2} = \frac{(u''v + u'v' - u'v' - v''u)v^2 - 2vv'(u'v - v'u)}{v^4}$$

$$\frac{(u''v - v''u)v^2 - 2vv'(u'v - v'u)}{v^4}$$

$$\cancel{\frac{u''}{v} - \frac{v''u}{v^2} - \frac{2u'v''}{v^2} + \frac{2uv'v''}{v^3}}$$

$$\frac{u''}{v} - \frac{v''u}{v^2} - \frac{2u'v'}{v^2} + \frac{2u(v')^2}{v^3}$$

$$\cancel{\frac{2v'}{v^2}\left(u' + \frac{uv'}{v}\right)}$$

$$-\frac{2u'}{u} \qquad F$$

$$-2\frac{u'}{u}\frac{v'}{v}\left(\frac{u}{v}\right)$$

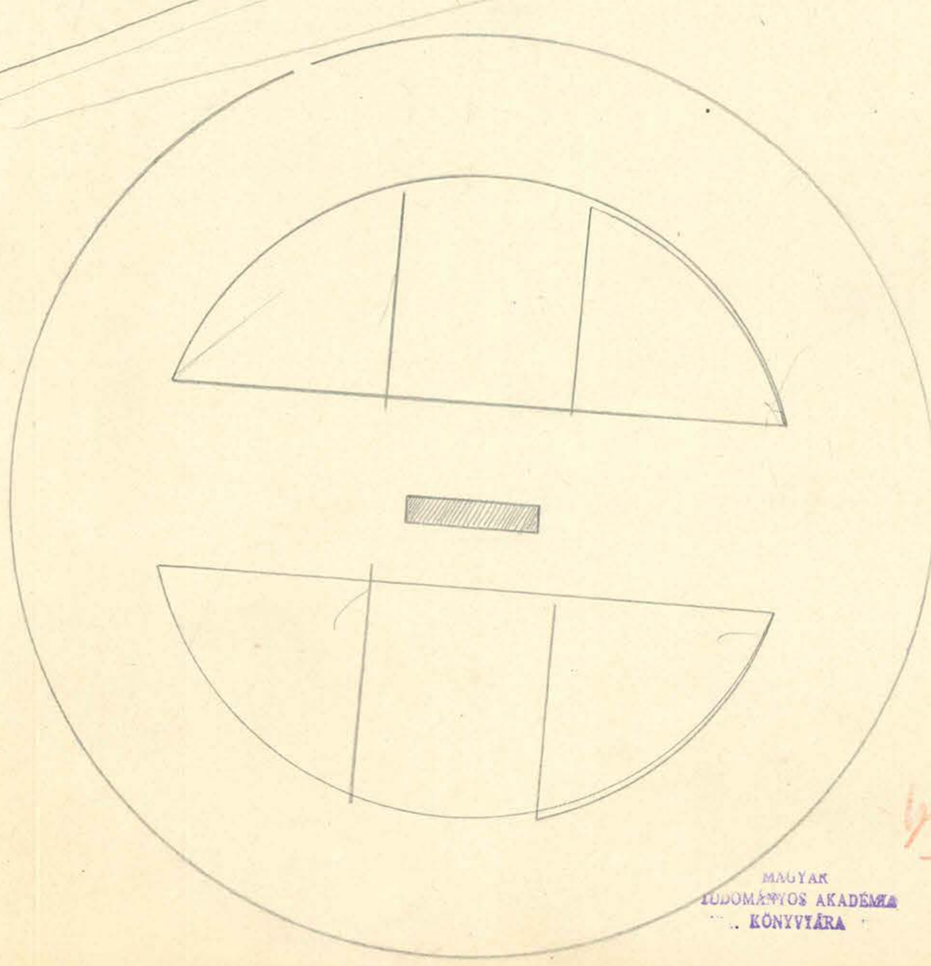
$$\frac{u}{v}\left(\frac{u''}{u} - \frac{v''}{v}\right) - 2F^2 \qquad 2F$$

$$F\left[\frac{u''}{u} - \frac{v''}{v} \mp 2\frac{v'}{v}\left(\frac{u'}{u} - \frac{v'}{v}\right)\right]$$

$$\frac{u'}{u}\frac{u}{v} - \frac{v'}{v}\frac{u}{v}$$

$$F\left(\frac{u'}{u} - \frac{v'}{v}\right)$$

$$F'' = F\left(\frac{u''}{u} - \frac{v''}{v}\right) - 2\frac{v'}{v}F'$$



Két gyenes elem ~~[illegible]~~ kölcsönös hatása.

$$dF_a = f\sigma s \frac{\sin(a-\alpha)\, da\, d\alpha\, \varrho^2 d\varrho\, r^2 dr\, d\zeta\, dz}{\left(r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2\right)^{\frac{3}{2}}}$$

$$dF_t = K \frac{\sin(a-\alpha)\, da\, d\alpha\, \varrho^2 d\varrho\, r^2 dr\, d\zeta\, dz}{\left(r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2\right)^{\frac{5}{2}}}$$

$$\underline{g^2 = \varrho^2+(z-\zeta)^2}$$

$$F = \frac{1}{3}\,\frac{g^2r^3-(3g^2r^2\varrho+2g^4\varrho)\cos(a-\alpha)+(r^3\varrho^2+6g^2r\varrho^2)\cos^2(a-\alpha)-3r^2\varrho^3\cos^3(a-\alpha)}{\left(g^2-\varrho^2\cos^2(a-\alpha)\right)^2\left(g^2+r^2-2r\varrho\cos(a-\alpha)\right)^{\frac{3}{2}}} \qquad \begin{matrix} = Sz. \\ \hline = N \end{matrix}$$

$$\frac{\partial F}{\partial a} = \frac{\left(+g^2\varrho(3r^2+2g^2)\sin(a-\alpha)-r\varrho^2(r^2+6g^2)\sin 2(a-\alpha)+g r^2\varrho^3\cos^2(a-\alpha)\sin(a-\alpha)\right)N}{N^2}$$

$$-\ \frac{3\,Sz.\left[2\left(g^2-\varrho^2\cos^2(a-\alpha)\right)\left(g^2+r^2-2r\varrho\cos(a-\alpha)\right)^{\frac{3}{2}}\varrho^2\sin 2(a-\alpha)+\frac{3}{2}\left(g^2-\varrho^2\cos^2(a-\alpha)\right)^2\left(g^2+r^2-2r\varrho\cos(a-\alpha)\right)^{\frac{1}{2}}2r\varrho\sin(a-\alpha)\right]}{N^2}$$

Vonzott ~~befoglyó~~ komponens $r\,\varrho\, d\varrho\, d\alpha\, d\zeta$ $r\, dr\, d\mu\, da\, dz$

$$\overline{AB}^2 = r^2 + \varrho^2 - 2r\varrho\cos(a-\alpha)$$

~~$d\mu\, dm$~~

~~$AC^2 = AB^2 - [r\sin(a-\alpha)]$~~, $AC = r\sin(a-\alpha)$

hossz menti $f\,\varrho\, d\mu\, dm \dfrac{r\sin(a-\alpha)}{\left(r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2\right)^{\frac{3}{2}}}$

4 hossz.. $K\,\varrho\, d\mu\, dm \dfrac{r\sin(a-\alpha)}{\left(r^2+\varrho^2-2r\varrho\cos(a-\alpha)+(z-\zeta)^2\right)^{\frac{5}{2}}}$

$-2r\varrho + r\varrho(a-\alpha)^2$

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

$\sigma s \int \varrho\, d\mu\, dr\, dz\, r^2 \int \dfrac{\sin(a-\alpha)\, da}{(\quad)^{\frac{3}{2}}}$

$\cos(a-\alpha) = x$

$\sin(a-\alpha)\, da = -dx$

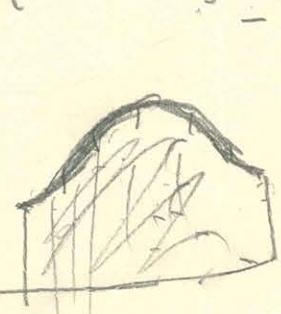
$-\sigma s \int \varrho\, d\mu\, dr\, dz\, r^2 \Big/ \dfrac{1}{r\varrho} \dfrac{1}{(\quad)^{\frac{1}{2}}}$

$a_0 - \frac{\lambda}{2}$ tól $a_0 + \frac{\lambda}{2}$

$-\sigma s \int \varrho\, d\mu\, dr\, dz \left\{ \dfrac{1}{\left[c - 2r\varrho + \varrho r\left\{(a_0-\alpha)^2 + \frac{\lambda^2}{4}\right\} \pm \varrho r(a_0-\alpha)\lambda\right]^{\frac{1}{2}}} \right.$

20

$\dfrac{a\, b\cos a\, x\, c_2}{(d + e\cos^2 a)^2 \ldots + g\cos a)^{3/2}}$



15 l.

$a + \varrho r(a_0 - \alpha)\lambda$

hossz....

$$V = V$$

$$\frac{2\left(\rho^2+r^2-2r\rho\cos(a-\alpha)\right)\rho^2\sin^2(a-\alpha)+\frac{3}{2}\left(\rho^2-\rho^2\cos^2(a-\alpha)\right)2r\rho\sin(a-\alpha)}{\left(\rho^2-\rho^2\cos^2(a-\alpha)\right)\left(\rho^2+r^2-2r\rho\cos(a-\alpha)\right)}$$

$$-k\,d\mu\,\frac{1}{\partial}\,\frac{1}{\rho}$$

$$\left\{\left(\rho^2-\rho\cos(a-\alpha)r\right)-\frac{1}{\rho}\right\}\int\frac{dx}{X'\sqrt{X'}}+\frac{1}{\rho}\int\frac{dx}{\sqrt{X'}}$$

$$f=\rho^2-\rho^2\cos^2(a-\alpha)$$

$$\rho=1$$

$$\frac{\left(\rho^2\cos^2(a-\alpha)-\rho r\cos(a-\alpha)\right)}{\sqrt{\left[\rho^2-\rho^2\cos^2(a-\alpha)\right]^2-\left(r^2+\rho^2-2r\rho\cos(a-\alpha)\right)\left(\rho^2-\rho^2\cos^2 a-\alpha\right)}}\;\log\left[\rho^2-\rho^2\cos^2(a-\alpha)\right]X^{\frac{1}{2}}+(\rho-\xi)\sqrt{}$$

$$\rho^2\sin^2(a-\alpha)-\left(r^2+\rho^2-2r\rho\cos(a-\alpha)\right)$$

$$-\rho^2\cos^2(a-\alpha)-r^2+2r\rho\cos(a-\alpha)$$

$$=-\left(\rho\cos\alpha-r\right)^2$$

$$\left(\rho^2-\rho^2\cos^2(a-\alpha)\right)^2$$

$$\rho^2+r^2-2r\rho$$

$1\cos^2$

164	451
125	420
222	481
	510
186	
90 re.	990 m.

$1 + \cos^2\alpha = 1$

$a = r^2 + (z-\zeta)^2$

$b = -2r\cos(a-\alpha)$

$c = 1$

$K = 4r^2 + 4(z-\zeta)^2 - 4r^2\cos^2(a-\alpha)$

$= 4r^2\sin^2(a-\alpha) + 4(z-\zeta)^2$

$$\int \frac{\varrho^2\,d\varrho}{\left(a - 2r\cos(a-\alpha)\varrho + \varrho^2\right)^{\frac{5}{2}}} = \left(-\frac{\varrho}{2} - \frac{r\cos(a-\alpha)}{6}\right)\frac{1}{X^{\frac{3}{2}}} + \left(\frac{r^2\cos^2(a-\alpha)}{2} + \frac{r^2+(z-\zeta)^2}{2}\right)\left\{\frac{4(\varrho - r\cos(a-\alpha))}{12\left(r^2\sin^2(a-\alpha) + (z-\zeta)^2\right)}\frac{1}{X^{\frac{3}{2}}} + \frac{2}{3}\frac{(\varrho - r\cos(a-\alpha))}{\left(r^2\sin^2(a-\alpha) + (z-\zeta)^2\right)^2}\frac{1}{X^{\frac{1}{2}}}\right\}$$

$$\frac{1}{3}\frac{\left(2\varrho^2 + (z-\zeta)^2 - \varrho^2\sin^2(a-\alpha)\right)\left(\varrho - \varrho\cos(a-\alpha)\right)}{\left(\varrho^2\sin^2(a-\alpha) + (z-\zeta)^2\right)^2}\frac{1}{X^{\frac{1}{2}}}$$

$$+\frac{1}{6}\frac{\left(2\varrho^2 + (z-\zeta)^2 - \varrho^2\sin^2(a-\alpha)\right)\left(r - \varrho\cos(a-\alpha)\right) - \left(3r + \varrho\cos(a-\alpha)\right)\left(\varrho^2\sin^2(a-\alpha) + (z-\zeta)^2\right)}{\varrho^2\sin(a-\alpha) + (z-\zeta)^2}\frac{1}{X^{\frac{3}{2}}}$$

$$\mathcal{N} = 6\left[\varrho^2\sin^2(a-\alpha) + (z-\zeta)^2\right]^2 X^{\frac{3}{2}}.$$

$\varrho^2 + (z-\zeta^2) = \underline{a}^2$

$$\mathcal{Z} = \left[2\varrho^2 + (z-\zeta)^2 - \varrho^2\sin^2(a-\alpha)\right]\left(r - \varrho\cos(a-\alpha)\right)\left[2\left(r^2 + \varrho^2 - 2r\varrho\cos(a-\alpha) + (z-\zeta)^2\right) + \left(\varrho^2\sin^2(a-\alpha) + (z-\zeta)^2\right)\right]$$

$$-\left[3r + \varrho\cos(a-\alpha)\right]\left[\varrho^2\sin^2(a-\alpha) + (z-\zeta)^2\right]^2$$

$$\left(a^2 + \varrho^2\cos^2\alpha\right)\left(r - \varrho\cos\alpha\right)\left[2\left(r^2 + a^2 - 2r\varrho\cos\alpha\right) + \left(a^2 - \varrho^2\cos^2\alpha\right)\right]$$

$$-\left(3r + \varrho\cos\alpha\right)\left(a^2 - \varrho^2\cos^2\alpha\right)^2 \qquad a^4 + \varrho^4\cos^4\alpha - 2a^2\varrho^2\cos^2\alpha$$

$a^2r - a^2\varrho\cos\alpha + r\varrho^2\cos^2\alpha - \varrho^3\cos^3\alpha$

$2a^2r^3 - 2a^2r^2\varrho\cos\alpha + 2r^3\varrho^2\cos^2\alpha - 2r^2\varrho^3\cos^3\alpha$

$+ 3a^4r - 3a^4\varrho\cos\alpha + 3a^2r\varrho^2\cos^2\alpha - 3a^2\varrho^3\cos^3\alpha$

$-4a^2r^2\varrho\cos\alpha + 4a^2r\varrho^2\cos^2\alpha - 4r^2\varrho^3\cos^3\alpha + 4r\varrho^4\cos^4\alpha$

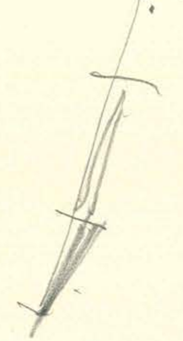
$-a^2r\varrho^2\cos\alpha + a^2\varrho^3\cos^3\alpha - r\varrho^4\cos^4\alpha + \varrho^5\cos^5\alpha$

$-3a^4r - 3r\varrho^4\cos^4\alpha + 6a^2r\varrho^2\cos^2\alpha - a^4\varrho\cos\alpha - \varrho^5\cos^5\alpha + 2a^2\varrho^3\cos^3\alpha$

$+2a^2r^3 - (6a^2r^2\varrho + 4a^4\varrho)\cos\alpha + (2r^3\varrho^2 + 12a^2r\varrho^2)\cos^2\alpha - 6r^2\varrho^3\cos^3\alpha$

a felső $\begin{cases} r \text{ felső} \begin{cases} z \text{ felső} \\ z \text{ alsó} \end{cases} \\ r \text{ alsó} \begin{cases} z \text{ felső} \\ z \text{ alsó} \end{cases} \end{cases}$

a felső	a felső	a felső	a felső
r felső	r felső	r alsó	r alsó
z felső	z alsó	z felső	z alsó



a alsó

a alsó

$$\left(r - \varrho \cos(\varphi - \alpha)\right)^2_{\min} \quad (z-\zeta)^2 \ldots$$

$$\operatorname{arc\,tg} \frac{z-\zeta}{\varrho \sin\alpha} \left(\frac{1}{\sqrt{1 + \frac{\varrho^2 \sin^2\alpha + (z-\zeta)^2}{(R - \varrho\cos\alpha)^2}}} - \frac{1}{\sqrt{1 + \frac{}{(r - \varrho\cos\alpha)^2}}} \right.$$

$$1 - \frac{(z-\zeta)^2}{\varrho^2 \sin^2\alpha} \cdot \frac{1}{\sqrt{}} \quad \frac{1}{\sqrt{}}$$

$$\operatorname{arc\,tg} \frac{(R - \varrho\cos\alpha)(z-\zeta)}{\varrho \sin\alpha \sqrt{(R - \varrho\cos\alpha)^2}}$$

$$\operatorname{arc\,tg} \frac{z-\zeta}{\varrho \sin\alpha \sqrt{1 + \frac{\varrho^2 \sin^2\alpha + (z-\zeta)^2}{(R-\varrho\cos\alpha)^2}}} - \operatorname{arc} \frac{z-\zeta}{\varrho \sin\alpha \sqrt{1 + \frac{\varrho^2 \sin^2\alpha + (z-\zeta)}{(r - \varrho\cos\alpha)^2}}}$$

$$\operatorname{arc\,tg} \frac{z-\zeta}{\varrho \sin\alpha} \Big\{$$

6 24/8

21
15

4,4
3,3

8 7 [8] 2,5/7

3,5

20,4

[11,7]

φ = 3,5/20 = ~~0,175~~ 1,65

400
144
256

128

~~2240~~

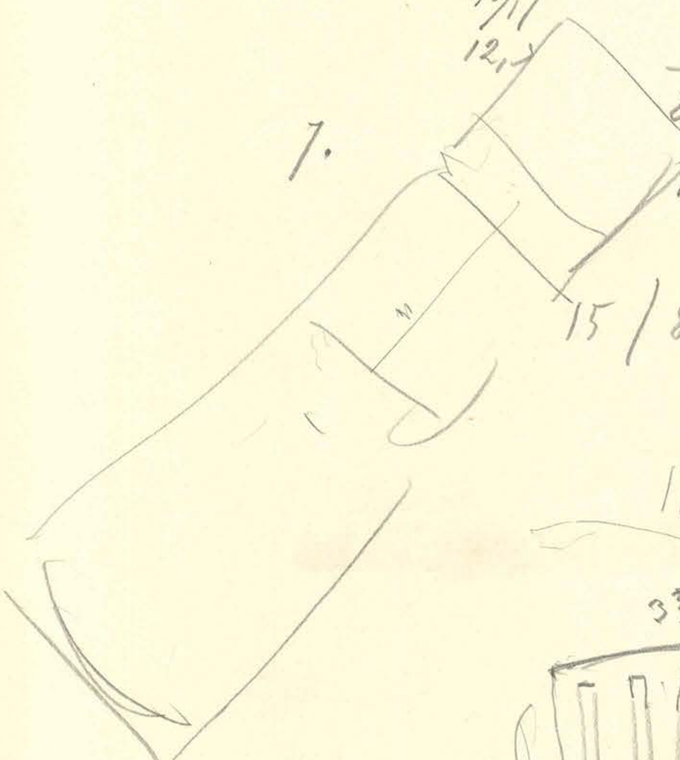
√21,12
9,12
12,0

19,7
12,1

388,09
151,29
236,80

118,40 · 7/15

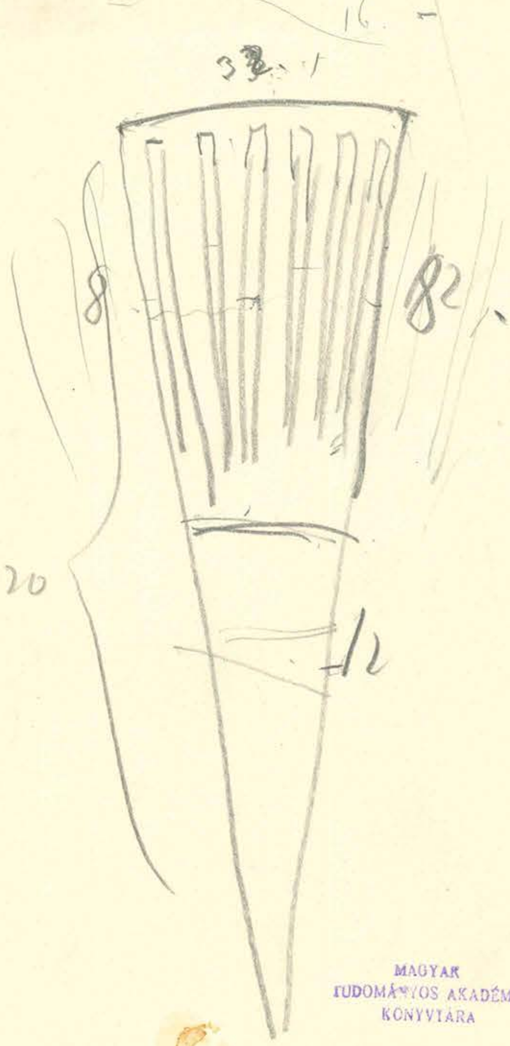
7.

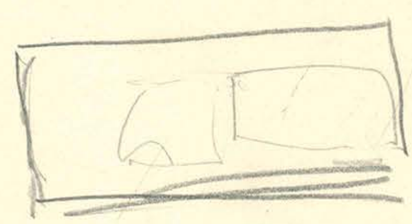


15 / 828,8

55,25

13 | 32 | 2,2
16





$(r-\rho\cos\alpha) - (R-\rho\cos\alpha)$

$$\frac{\dfrac{R-\rho\cos\alpha}{\sqrt{(R-\rho\cos\alpha)^2+\rho^2\sin^2\alpha+(z-\zeta)^2}} - \dfrac{r-\rho\cos\alpha}{\sqrt{(r-\rho\cos\alpha)^2+\rho^2\sin^2\alpha+(z-\zeta)^2}}}{1-\dfrac{(z-\zeta)^2}{\rho^2\sin^2\alpha}\,\dfrac{(R-\rho\cos\alpha)(r-\rho\cos\alpha)}{\sqrt{(R-\rho\cos\alpha)^2+\rho^2\sin^2\alpha+(z-\zeta)^2}\sqrt{(r-\rho\cos\alpha)^2+\rho^2\sin^2\alpha+(z-\zeta)^2}}}$$

$$\frac{(R-\rho\cos\alpha)\sqrt{(r-\rho\cos\alpha)^2+\rho^2\sin^2\alpha+(z-\zeta)^2} - (r-\rho\cos\alpha)\sqrt{(R-\rho\cos\alpha)^2+\rho^2\sin^2\alpha+(z-\zeta)^2}}{\rho^2\sin^2\alpha\sqrt{(R-\rho\cos\alpha)^2+\rho^2\sin^2\alpha+(z-\zeta)^2}\sqrt{(r-\rho\cos\alpha)^2+} - \dfrac{(z-\zeta)^2(R-\rho\cos\alpha)(r-\rho\cos\alpha)}{\rho^2\sin^2\alpha}}$$

$R-\rho = 2 \quad r-\rho = +10$

$\sin a - \alpha = ~~0,0011~~ = 11 . 10^{-4}$

$\sin^2(a - \alpha) = \alpha_1' = 121\ 10^{-8}$

$\sin^3(a - \alpha) = 1331 . 10^{-12}$

$\sin^4(a - \alpha) = 14641\ 10^{-16}$

0,421604 −1
0,955642
0,465962 −2
1° 40′ 29″

0,0174533
116355
1406
0,029229

0,7891938 . 10^{-7}

+ 539,02998 . 10^9
+ 1,90066 10^9
+ 540,93058 . 10^9
+ 540,94666 . 10^9
− 0,01608 10^9.

190 060,606 . 10^4

0,540946656 10^{12}

$\frac{1}{10}$ o.v. cinál $F = \frac{1}{500000}$ F = 0,00002 $F = 20 . 10^{-6}$

66,720 . 121 . 10^{+2} 5749
5750000 10^{-15}

$\frac{f \sigma s b \beta \varepsilon^2}{100000} = 5{,}75\ 10^{-9} = 5{,}75\ 10^{-14}$

~~0,06441 . 10~~
0,09246 . 10^{-5}
~~0,009246 10^{-6}~~
0,9246 10^{-6}.

$$\frac{\sin\alpha}{z^2+\varrho\varrho'\sin^2\alpha} \qquad \frac{\cos\alpha}{z^2+\varrho\varrho'\sin^2\alpha} - \frac{2\sin^2\alpha\cos\alpha\,\varrho\varrho'}{(z^2+\varrho\varrho'\sin^2\alpha)^2}$$

$$(z^2+\varrho\varrho'\sin^2\alpha) \sout{\cos\alpha} = 2\sin^2\alpha \sout{\cos}\alpha\,\varrho\varrho'$$

$$z^2=\varrho\varrho'\sin^2\alpha,$$

$$\sin\alpha=\frac{z}{\sqrt{\varrho\varrho'}} = \frac{3}{155}$$

$$\frac{240\cdot\frac{3}{155}}{18} \qquad \frac{720}{2790}=0{,}258$$

$$F=f\rho\sigma b\beta\varepsilon^2\left\{\frac{\varrho'^3-\varrho^3}{3}\frac{\cos^2(a-\alpha)}{\sin(a-\alpha)}-(\varrho'-\varrho)\frac{\cos^2(a-\alpha)(z-\xi)^2}{\sin^3(a-\alpha)}+\right.$$

$$\left.+\frac{\cos^2(a-\alpha)}{\sin^4(a-\alpha)}(z-\xi)^3\left(\frac{(\varrho'-\varrho)(z-\xi)\sin(a-\alpha)}{(z-\xi)^2+\varrho\varrho'\sin^2(a-\alpha)}-\frac{1}{3}\frac{(\varrho'-\varrho)^3(z-\xi)^3\sin^3(a-\alpha)}{((z-\xi)^2+\varrho\varrho'\sin^2(a-\alpha))^3}\right)\right\}$$

$\sin n\varepsilon+\vartheta$

$\sin -n\varepsilon+\vartheta$, $2\sin\vartheta\cos n\varepsilon$

$\sin a - \alpha = ~~0,0011~~ = 11 . 10^{-4}$

$\sin^2(a-\alpha) = ~~\alpha_1'~~ = 121\ 10^{-8}$

$\sin^3(a-\alpha) = 1331 . 10^{-12}$

$\sin^4(a-\alpha) = 14641\ 10^{-16}$

$0,421604 - 1$
$0,955642$
$0,465962 - 2$

$1^\circ\ 40'\ 29''$

$0,0174533$
116355
1406
$0,0292294$

$0,7891938 . 10^{-7}$

$+\ 539,02998 . 10^{9}$
$+\ 1,90006\ 10^{9}$
$+\ 540,93058 . 10^{9}$
$+\ 540,94666 . 10^{9}$
$-\ 0,01608\ 10^{9}.$

$190060,606 . 10^{4}$

$0,540946656\ 10^{12}$

$\frac{1}{10}$ o.v.-nál $F = \frac{1}{50000}$ $F = 0,00002$ $F = 20 . 10^{-6}$

$66.720.121 . 10^{+2}$

5749

$5750000\ 10^{-15}$

$\frac{50 s b p \varepsilon^2}{100000} = 5,75\ 10^{-9} = 5,75\ 10^{-14}.$

~~$0,06144 . 10$~~

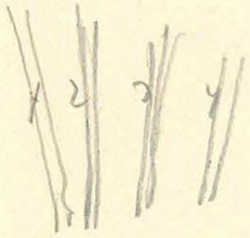
$0,09246 . 10^{-5}$

~~$0,09246\ 10$~~$^{-6}$

$0,9246\ 10^{-6}.$

II =

$d\mu \, s f \Delta\alpha \, \delta \frac{\rho^3 \cos^2\alpha \sin\alpha}{(\rho^2 \sin^2\alpha + z^2)}$ $z-\xi$



$d\mu = \rho \Delta\alpha \, \delta \, d\rho \, \sigma$

$a-\alpha$

$\int s\sigma \, b . p . \varepsilon^2 \cos^2(a-\alpha) \sin(a-\alpha) \int \frac{\rho^4 d\rho}{\rho^2 \sin^2(a-\alpha) + (z-\xi)^2}$

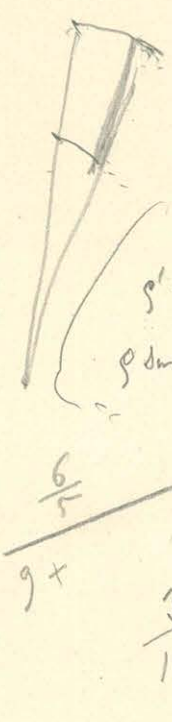
$\int \frac{\rho^4 d\rho}{\rho^2 \sin^2(a-\alpha) + (z-\xi)^2} = \frac{\rho^3}{3 \sin^2(a-\alpha)} - \frac{(z-\xi)^2 \rho}{\sin^4(a-\alpha)} + \frac{(z-\xi)^3}{\sin^5(a-\alpha)} \operatorname{arctg} \rho \frac{\sin(a-\alpha)}{z-\xi}$

$F = \int s\sigma \, b p \, \varepsilon^2 \left\{ \frac{\cos^2(a-\alpha)}{\sin^4(a-\alpha)} (z-\xi)^3 \left(\operatorname{arctg} \rho' \frac{\sin(a-\alpha)}{z-\xi} - \operatorname{arctg} \rho \frac{\sin(a-\alpha)}{z-\xi} \right) - (\rho' - \rho) \frac{\cos^2(a-\alpha)(z-\xi)^2}{\sin^3(a-\alpha)} + \frac{(\rho'^3 - \rho^3)}{3} \frac{\cos^2(a-\alpha)}{\sin(a-\alpha)} \right\}$

$\operatorname{arctg} \frac{(\rho' - \rho)(z-\xi) \sin(a-\alpha)}{(z-\xi)^2 + \rho\rho' \sin^2(a-\alpha)}$

$a - \alpha = (a_0 - \alpha_0) + \vartheta$

1	$a_0 - \alpha_0$	2	3	4	5	6	7	8
1	0	-2ε	-4ε					-14ε
	2ε	0	-2ε					-12ε
	4ε	2ε	0					-10ε
	6ε	4ε						
	8ε							
	10ε							
	12ε							
	14ε	12ε	10ε					



$z - \xi = 3$

$\rho' = 200$ $\rho = 120$

$\rho \sin(a-\alpha) = 19$ $\rho' \sin(a-\alpha) = 32$

$\frac{5.13\ 39}{617}$

$\operatorname{arctg} \frac{(\rho' - \rho) \sin(a-\alpha)}{(z-\xi)\left(1 + \rho\rho' \frac{\sin^2(a-\alpha)}{(z-\xi)^2}\right)}$

$\frac{6}{5}$ 9^+

$\frac{3}{15}$

8 sin 0

7 sin $\pm 2\varepsilon$ $\varepsilon_1 = 2\varepsilon$

6 $\pm 4\varepsilon$

5 sin $\pm 6\varepsilon$

4 sin $\pm 8\varepsilon$

3 $\pm 10\varepsilon$

2 $\pm 12\varepsilon$

1 $\pm 14\varepsilon$

$\operatorname{arc} \rho' x - \operatorname{arctg} \rho x$

$\operatorname{arctg} \frac{(\rho' - \rho) x}{1 + \rho\rho' x^2}$

$\operatorname{arctg} \frac{(\rho' - \rho)(z-\xi) \sin(a-\alpha)}{(z-\xi)^2 + \rho\rho' \sin^2(a-\alpha)}$

$$F = f\,\sigma_1 b \beta\, \varepsilon^2 \left\{ \cos^2(a-\alpha) \left\{ \frac{(z-\zeta)^3}{\sin^2(a-\alpha)} \operatorname{arctg} \frac{(\varrho'-\varrho)(z-\zeta)\sin(a-\alpha)}{(z-\zeta)^2 + \varrho\varrho' \sin^2(a-\alpha)} - \frac{(\varrho'-\varrho)(z-\zeta)^2}{\sin^3(a-\alpha)} + \frac{\varrho'^3-\varrho^3}{3\sin(a-\alpha)} \right\} \right.$$

$a-\alpha = n2\pi \pm \frac{1}{10}\varepsilon$ $\qquad \varepsilon = 0{,}011 \qquad \varrho'-\varrho = 80 \qquad \varrho\varrho' = 24000$

$z-\zeta = 3 \qquad \varrho'^3-\varrho^3 = 6272000$

$n = 0$