Ms 5100/22. Schluderbachi mérések 1913

(2)

Ügyesek

Schlundokaly

1913

$$\frac{\partial X'}{\partial z} = \frac{\partial X}{\partial z} = -3a \qquad r\frac{\partial X'}{\partial z} = -3a\cos\varphi + 3b\sin\varphi\sin\lambda - 3c\sin\varphi\cos\lambda$$

$$\underline{\frac{\partial Z'}{\partial x} = \frac{X}{r} + \frac{1}{r}\frac{\partial Z}{\partial \varphi}} \qquad \underline{r\cdot\frac{\partial Z'}{\partial x} = X + \frac{\partial Z}{\partial \varphi}}$$

$$r\frac{\partial X'}{\partial z} = -3a\cos\varphi + 3b\sin\varphi\sin\lambda - 3c\sin\varphi\cos\lambda$$
$$-4e\cos\varphi\sin\lambda - 2f\sin2\varphi\sin2\lambda + 4g\cos2\varphi\cos\lambda - 2i\sin2\varphi\cos2\lambda$$
$$-4k\sin2\varphi$$

$$r\frac{\partial Z'}{\partial \varphi} = -3a\cos\varphi + 3b\sin\varphi\sin\lambda - 3c\sin\varphi\cos\lambda$$
$$-4e\cos\varphi\sin\lambda - 2f\sin2\varphi\sin2\lambda + 4g\cos2\varphi\cos\lambda - 2i\sin2\varphi\cos2\lambda$$
$$-4k\sin2\varphi,$$

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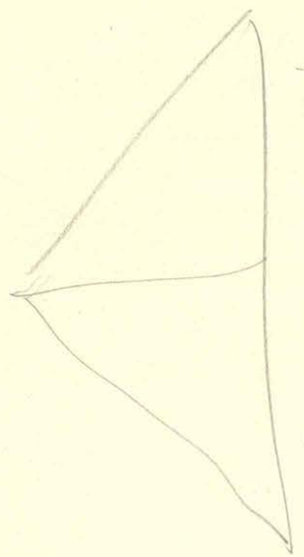

$$X = \frac{2\pi R^2 i}{((a-x)^2 + R^2)^{\frac{3}{2}}}$$

$$X = 2\pi R^2 i \frac{2}{R^3 (5)^{\frac{3}{2}}}$$

$$\frac{\partial X}{\partial y \partial x} + \frac{\partial Y}{\partial y \partial y} + \frac{\partial Z}{\partial y \partial z}.$$

$$\frac{\partial X}{\partial x} = -2\pi R^2 i \frac{3R}{R^5 5^{\frac{5}{2}}}$$

$$\partial y \partial x^2 + \partial y^3 + \partial y \partial z^2$$

$$\frac{\partial X}{\partial x} = 2\pi R^2 i \frac{3x}{(x^2+R^2)^{\frac{5}{2}}}$$

$$\partial y^2 \partial x^2 + \partial y^4 + \partial y^2 \partial z^2$$

$$3R^2 + 3x^2 - 15x^2$$

$$12x^2 = 3R^2$$

$$x^2 = \frac{1}{4} R^2$$

$$x = \frac{1}{2} R.$$

$$\frac{\partial X}{\partial x^2} = 2\pi R^2 i \left(\frac{3}{(x^2+R^2)^{\frac{5}{2}}} - \frac{15x^2}{(x^2+R^2)^{\frac{7}{2}}} \right)$$

$R = 20$

$\frac{1}{100}$

$$\frac{\partial X}{\partial x} \qquad \frac{\partial Y}{\partial x} \qquad \frac{\partial Z}{\partial x}$$

$$\frac{\partial X}{\partial x^2} + \frac{\partial Y}{\partial x \partial y} + \frac{\partial Z}{\partial x \partial z}$$

$$\frac{\frac{\partial X}{\partial x}}{X} = \frac{3}{2} \frac{1}{R} 5 = \frac{3}{10} \frac{1}{R}$$

$$\frac{\partial V}{\partial x^3} + \frac{\partial V}{\partial x \partial y^2} + \frac{\partial V}{\partial x \partial z^2}.$$

$$-\frac{15}{r^5} + 105 \frac{(a-x)^2}{r^7} + 15 \frac{r^2 - (a-x)^2}{r^7} - 90 \frac{(a-x)^2}{r^7}$$

$$\frac{\partial(\frac{1}{r})}{\partial x^4} + \frac{\partial(\frac{1}{r})}{\partial x^2 \partial y^2} + \frac{\partial \frac{1}{r}}{\partial x^2 \partial z^2}.$$

x^4z	0	0	$+\frac{45}{r^6}$	$-\frac{45}{r^6}$
x^2y^2z	0	0	—	
x^2z^3	0	0	—	
x^3yz	0	0	—	
x^2z^2y	0	0	$+\frac{15}{r^6}$	$-\frac{15}{r^6}$
x^3z^2	$-\frac{60}{r^6}$	$+\frac{60}{r^6}$	—	
x^3yz	—	—	—	
xzy^3	—	—	—	
xyz^3	—	—	—	
x^2y^2z	—	—	—	
xy^2z^2	$+\frac{15}{r^6}$	$-\frac{15}{r^6}$	—	
x^2yz^2	—	—	$+\frac{15}{r^6}$	$-\frac{15}{r^6}$
x^3z^2	$-\frac{60}{r^6}$	$+\frac{60}{r^6}$	—	
xy^2z^2	$+\frac{15}{r^6}$	$-\frac{15}{r^6}$	—	
xz^4	$+\frac{45}{r^6}$	$-\frac{45}{r^6}$	—	
x^2yz^2	—	—	$+\frac{15}{r^6}$	$-\frac{15}{r^6}$
xyz^3	—	—	—	
z^3x^2	—	—	—	

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$\partial x^3 =$	$+\frac{6}{r^4}$	$-\frac{6}{r^4}$	0	
x^2y	0	0	$-\frac{3}{r^4}$	$+\frac{3}{r^4}$
x^2z	0	0	0	0

$+\frac{24}{r^5}$	$-+\frac{24}{r^5}$	$+\frac{9}{r^5}$	$+\frac{9}{r^5}$
0	0	0	0
0	0	0	0
0	0	0	0
$-\frac{12}{r^5}$	$-\frac{12}{r^5}$	$-\frac{12}{r^5}$	$-\frac{12}{r^5}$
0	0	0	0
0	0	0	0
0	0	0	0
$-\frac{12}{r^5}$	$-\frac{12}{r^5}$	$-\frac{12}{r^5}$	$-\frac{12}{r^5}$

x^5	$+\frac{120}{r^6}$	$-\frac{120}{r^6}$	0	0
x^3y^2	$-\frac{60}{r^6}$	$+\frac{60}{r^6}$	0	0
x^3z^2	$-\frac{60}{r^6}$	$+\frac{60}{r^6}$	0	0
x^4y	0	0	$+\frac{45}{r^6}$	$-\frac{45}{r^6}$
x^3yz	0	0	0	0
x^4z	0	0	0	0
x^4y	0	0	$+\frac{45}{r^6}$	$-\frac{45}{r^6}$
x^2y^3	0	0	$-\frac{60}{r^6}$	$+\frac{60}{r^6}$
x^2yz^2	0	0	$+\frac{15}{r^6}$	$-\frac{15}{r^6}$
x^3y^2	$-\frac{60}{r^6}$	$+\frac{60}{r^6}$	0	0
x^2y^2z	0	0	0	0
x^3yz	0	0	0	0
x^4z	0	0	0	0
x^2y^2z	0	0	0	0
x^2z^3	0	0	0	0
x^3yz	0	0	0	0
x^2yz^2	0	0	$+\frac{15}{r^6}$	$-\frac{15}{r^6}$
x^3z^2	$-\frac{60}{r^6}$	$+\frac{60}{r^6}$	0	0

Magn. Körpermitte a, b, c. Schedebuch 1913 I

$$b = 0 \qquad c = 0 \qquad r = a \qquad x, y, z = 0$$

$$V = \frac{1}{a^2}\int \alpha\, d\tau - \frac{2}{a^3}\int \alpha\xi\, d\tau$$

$$\frac{\partial V}{\partial x} = \frac{2}{a^3}\int \alpha\, d\tau - \frac{6}{a^4}\int \alpha\xi\, d\tau + \frac{3}{a^4}\int \beta\eta\, d\tau + \frac{3}{a^4}\int \gamma\zeta\, d\tau$$

$$\frac{\partial V}{\partial y} = -\frac{1}{a^3}\int \beta\, d\tau + \frac{3}{a^4}\int \alpha\eta\, d\tau + \frac{3}{a^4}\int \beta\xi\, d\tau$$

$$\frac{\partial V}{\partial z} = -\frac{1}{a^3}\int \gamma\, d\tau + \frac{3}{a^4}\int \alpha\zeta\, d\tau + \frac{3}{a^4}\int \gamma\xi\, d\tau$$

$$\frac{\partial^2 V}{\partial x^2} = +\frac{6}{a^4}\int \alpha\, d\tau - \frac{24}{a^5}\int \alpha\xi\, d\tau + \frac{12}{a^5}\int \beta\eta\, d\tau + \frac{12}{a^5}\int \gamma\zeta\, d\tau$$

$$\frac{\partial^2 V}{\partial y^2} = -\frac{3}{a^4}\int \alpha\, d\tau + \frac{12}{a^5}\int \alpha\xi\, d\tau - \frac{9}{a^5}\int \beta\eta\, d\tau - \frac{12}{a^5}\int \gamma\zeta\, d\tau$$

$$\frac{\partial^2 V}{\partial z^2} = -\frac{3}{a^4}\int \alpha\, d\tau + \frac{12}{a^5}\int \alpha\xi\, d\tau - \frac{12}{a^5}\int \beta\eta\, d\tau - \frac{9}{a^5}\int \gamma\zeta\, d\tau$$

$$\frac{\partial^2 V}{\partial x \partial z} = -3\,\frac{c-z}{r^5}A + 15\,\frac{(a-x)(c-z)}{r^7}\{\quad\} - 3\,\frac{a-x}{r^5}C$$

$$+15\,\frac{c-z}{r^7}\{(b-y)H + (c-z)K\} - 3\,\frac{K}{r^5} - 105\,\frac{(a-x)(c-z)}{r^9}\{\quad\} + 15\,\frac{a-x}{r^7}\big((b-y)J + (a-x)K\big)$$

$$\frac{\partial^2 V}{\partial z \partial x} = -3\,\frac{a-x}{r^5}C + 15\,\frac{(a-x)(c-z)}{r^7}\{\quad\} - 3\,\frac{c-z}{r^5}A$$

$$+15\,\frac{a-x}{r^7}\{(b-y)J + (a-x)K\} - 3\,\frac{K}{r^5} - 105\,\frac{(a-x)(c-z)}{r^9}\{\quad\} + 15\,\frac{c-z}{r^7}\big((b-y)H + (a-x)K\big)$$

$$+10\,\frac{(a-x)(c-z)}{r^7}E - 105\,\frac{(a-x)(c-z)}{r^9}\{\quad\} + 10\,\frac{(a-x)(c-z)}{r^7}G$$

$$+10\,\frac{(a-x)(c-z)}{r^7}G - 105\,\frac{(a-x)(c-z)}{r^9}\{\quad\} + 10\,\frac{(a-x)(c-z)}{r^7}E.$$

$$V = \frac{a-x}{r^3}\overset{\mathfrak{A}}{\int}\alpha\,d\tau + \frac{b-y}{r^3}\overset{\mathfrak{B}}{\int}\beta\,d\tau + \frac{c-z}{r^3}\overset{\mathfrak{C}}{\int}\gamma\,d\tau$$

$$-\frac{(a-x)^2}{r^5}\left\{2\int\xi\alpha\,d\tau - \int\eta\beta\,d\tau - \int\zeta\gamma\,d\tau\right\}^{\mathfrak{E}}$$

$$-\frac{(b-y)^2}{r^5}\left\{2\int\eta\beta\,d\tau - \int\zeta\gamma\,d\tau - \int\xi\alpha\,d\tau\right\}^{\mathfrak{F}}$$

$$-\frac{(c-z)^2}{r^5}\left\{2\int\gamma\zeta\,d\tau - \int\xi\alpha\,d\tau - \int\beta\eta\,d\tau\right\}^{\mathfrak{G}}$$

$$-3\frac{(a-x)(b-y)}{r^5}\left\{\int\eta\alpha\,d\tau + \int\xi\beta\,d\tau\right\}^{\mathfrak{H}}$$

$$-3\frac{(b-y)(c-z)}{r^5}\left\{\int\zeta\beta\,d\tau + \int\eta\gamma\,d\tau\right\}^{\mathfrak{J}}$$

$$-3\frac{(c-z)(a-x)}{r^5}\left\{\int\xi\gamma\,d\tau + \int\zeta\alpha\,d\tau\right\}^{\mathfrak{K}}$$

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$$\cancel{\frac{\partial V}{\partial x} = -\frac{1}{r^3}\left\{\int\alpha\,d\tau + \int\beta\,d\tau + \int\gamma\,d\tau\right\} + 3\frac{(a-x)^2}{r^5}\int\alpha\,d\tau + 3\frac{(b-y)^2}{r^5}\int\beta\,d\tau + 3\frac{(c-z)^2}{r^5}\int\gamma\,d\tau}$$

$$\cancel{\frac{\partial V}{\partial x} = -\frac{1}{r^3}(\mathfrak{A} + \ldots) + 3\frac{(a-x)^2}{r^5}\mathfrak{A} + 3\frac{(a-x)(b-y)}{r^5}\mathfrak{B} + 3\frac{(a-x)(c-z)}{r^5}\mathfrak{C}}$$

$$\cancel{+\frac{2(a-x)}{r^5}\mathfrak{E} + \ldots - 5\frac{(a-x)^3}{r^7}\mathfrak{E} - 5\frac{(b-y)^2}{r^7}\mathfrak{F} - 5\frac{(c-z)^2}{r^7}\mathfrak{G}}$$

$$\cancel{+3\frac{(b-y)}{r^5}\mathfrak{H} + 3\frac{(c-z)}{r^5}\mathfrak{K} + \ldots - 15\frac{(a-x)^2(b-y)}{r^7}\mathfrak{H} - 15\frac{(a-x)(b-y)(c-z)}{r^7}\mathfrak{J}}$$

$$\cancel{-15\frac{(a-x)^2(c-z)}{r^7}\mathfrak{K}}$$

$$\cancel{\frac{\partial V}{\partial y} = -\frac{1}{r^3}\mathfrak{B}}$$

$$\frac{\partial V}{\partial x} = -\frac{1}{r^3}\mathfrak{A} + 3\frac{(a-x)}{r^5}\left\{(a-x)\mathfrak{A} + (b-y)\mathfrak{B} + (c-z)\mathfrak{C}\right\} + \frac{2(a-x)}{r^5}\mathfrak{E} - 5\frac{a-x}{r^7}\left\{(a-x)^2\mathfrak{E} + (b-y)^2\mathfrak{F} + (c-z)^2\mathfrak{G}\right\}$$

$$+\frac{3}{r^5}\left\{(b-y)\mathfrak{H} + (c-z)\mathfrak{K}\right\} - 15\frac{a-x}{r^7}\left\{(a-x)(b-y)\mathfrak{H} + (b-y)(c-z)\mathfrak{J} + (c-z)(a-x)\mathfrak{K}\right\}$$

$$\frac{\partial V}{\partial y} = -\frac{1}{r^3}\mathfrak{B} + 3\frac{b-y}{r^5}\left\{(a-x)\mathfrak{A} + (b-y)\mathfrak{B} + (c-z)\mathfrak{C}\right\} + \frac{2(b-y)}{r^5}\mathfrak{F} - 5\frac{(b-y)}{r^7}\left\{(a-x)^2\mathfrak{E} + (b-y)^2\mathfrak{F} + (c-z)^2\mathfrak{G}\right\}$$

$$+\frac{3}{r^5}\left\{(a-x)\mathfrak{H} + (c-z)\mathfrak{J}\right\} - 15\frac{b-y}{r^7}\left\{(a-x)(b-y)\mathfrak{H} + (b-y)(c-z)\mathfrak{J} + (c-z)(a-x)\mathfrak{K}\right\}$$

$$\frac{\partial V}{\partial z} = -\frac{1}{r^3}\mathfrak{C} + 3\frac{c-z}{r^5}\left\{(a-x)\mathfrak{A} + (b-y)\mathfrak{B} + (c-z)\mathfrak{C}\right\} + 2\frac{(c-z)}{r^5}\mathfrak{G} - 5\frac{(c-z)}{r^7}\left\{(a-x)^2\mathfrak{E} + (b-y)^2\mathfrak{F} + (c-z)^2\mathfrak{G}\right\}$$

$$+\frac{3}{r^5}\left\{(b-y)\mathfrak{J} + (a-x)\mathfrak{K}\right\} - 15\frac{c-z}{r^7}\left\{(a-x)(b-y)\mathfrak{H} + (b-y)(c-z)\mathfrak{J} + (c-z)(a-x)\mathfrak{K}\right\}$$

$$\frac{\partial^2 V}{\partial x^2} = -6\,\frac{a-x}{r^5}A + \frac{3}{r^5}\left(5\frac{(a-x)^2}{r^2}-1\right)\left\{(a-x)A+(b-y)B+(c-z)C\right\}$$

$$-\frac{2}{r^5}E - \frac{5}{r^7}\left(7\frac{(a-x)^2}{r^2}-1\right)\left\{(a-x)^2E+(b-y)^2F+(c-z)^2G\right\} + 20\frac{(a-x)^2}{r^7}E$$

$$-\frac{15}{r^7}\left(7\frac{(a-x)^2}{r^2}-1\right)\left\{(a-x)(b-y)H+(b-y)(c-z)J+(c-z)(a-x)K\right\}$$

$$+30\,\frac{a-x}{r^7}\left\{(b-y)H+(c-z)K\right\}$$

$$\frac{\partial^2 V}{\partial y^2} = -6\,\frac{b-y}{r^5}B + \frac{3}{r^5}\left(5\frac{(b-y)^2}{r^2}-1\right)\left\{(a-x)A+(b-y)B+(c-z)C\right\}$$

$$-\frac{2}{r^5}F - \frac{5}{r^7}\left(7\frac{(b-y)^2}{r^2}-1\right)\left\{(a-x)^2E+(b-y)^2F+(c-z)^2G\right\} + 20\frac{(b-y)^2}{r^7}F$$

$$-\frac{15}{r^7}\left(7\frac{(b-y)^2}{r^2}-1\right)\left\{(a-x)(b-y)H+(b-y)(c-z)J+(c-z)(a-x)K\right\}$$

$$+30\,\frac{b-y}{r^7}\left\{(a-x)H+(c-z)J\right\}$$

$$\frac{\partial^2 V}{\partial z^2} = -6\,\frac{c-z}{r^5}C + \frac{3}{r^5}\left(5\frac{(c-z)^2}{r^2}-1\right)\left\{(a-x)A+(b-y)B+(c-z)C\right\}$$

$$-\frac{2}{r^5}G - \frac{5}{r^7}\left(7\frac{(c-z)^2}{r^2}-1\right)\left\{(a-x)^2E+(b-y)^2F+(c-z)^2G\right\}$$

$$-\frac{15}{r^7}\left(7\frac{(c-z)^2}{r^2}-1\right)\left\{(a-x)(b-y)H+(b-y)(c-z)J+(c-z)(a-x)K\right\}$$

$$+30\,\frac{c-z}{r^7}\left\{(b-y)J+(a-x)K\right\}$$

$$\frac{\partial^2 V}{\partial x\partial z} = \frac{\partial}{\partial x}\left(\frac{\partial V}{\partial z}\right) = \frac{\partial}{\partial z}\left(\frac{\partial V}{\partial x}\right) = -3\,\frac{a-x}{r^5}C - 3\,\frac{c-z}{r^5}A + 15\,\frac{(a-x)(c-z)}{r^7}\left\{(a-x)A+(b-y)B+(c-z)C\right\}$$

$$+15\,\frac{c-z}{r^7}\left\{(b-y)H+(c-z)K\right\} + 15\,\frac{a-x}{r^7}\left\{(b-y)J+(a-x)K\right\} - 35\,\frac{(a-x)(c-z)}{r^9}\left\{(a-x)(b-y)H+(b-y)(c-z)J+(c-z)(a-x)K\right\}$$

$$\cancel{\frac{\partial^2 V}{\partial y\partial z} = \frac{\partial}{\partial y}\left(\frac{\partial V}{\partial z}\right) = \frac{\partial}{\partial z}\left(\frac{\partial V}{\partial y}\right) = -3\,\frac{b-y}{r^5}C - 3\,\frac{c-z}{r^5}B + 15\,\frac{(b-y)(c-z)}{r^7}\left\{(a-x)A+(b-y)B+(c-z)C\right\}}$$

$$+10\,\frac{(a-x)(c-z)}{r^7}(E+G) - 105\,\frac{(a-x)(c-z)}{r^9}\left\{(a-x)^2E+(b-y)^2F+(c-z)^2G\right\}$$

$$-3\,\frac{1}{r^5}K$$

$$\frac{\partial^2 V}{\partial y \partial z} = \frac{\partial}{\partial y}\left(\frac{\partial V}{\partial x}\right) = \frac{\partial}{\partial x}\left(\frac{\partial V}{\partial y}\right) = -3\frac{b-y}{r^5}\mathfrak{C} - 3\frac{c-z}{r^5}B + 15\frac{(b-y)(c-z)}{r^7}\left\{(a-x)A + (b-y)B + (c-z)\mathfrak{C}\right\}$$

$$+10\frac{(b-y)(c-z)}{r^7}(F+G) - 35\frac{(b-y)(c-z)}{r^9}\left\{(a-x)^2 E + (b-y)^2 F + (c-z)G\right\}$$

$$+15\frac{(c-z)}{r^7}\left\{(a-x)H + (c-z)J\right\} + 15\frac{b-y}{r^7}\left\{(b-y)J + (a-x)K\right\} - 105\frac{(b-y)(c-z)}{r^9}\left\{(a-x)(b-y)H + (b-y)(c-z)J + (c-z)(a-x)K\right\}$$

$$-3\frac{1}{r^5}J$$

$$\frac{\partial^2 V}{\partial x \partial y} = \frac{\partial}{\partial y}\left(\frac{\partial V}{\partial x}\right) = \frac{\partial}{\partial x}\left(\frac{\partial V}{\partial y}\right) = -3\frac{b-y}{r^5}A - 3\frac{a-x}{r^5}B + 15\frac{(a-x)(b-y)}{r^7}\left\{(a-x)A + (b-y)B + (c-z)\mathfrak{C}\right\}$$

$$+10\frac{(a-x)(b-y)}{r^7}(E+F) - 35\frac{(a-x)(b-y)}{r^9}\left\{(a-x)^2 E + (b-y)^2 F + (c-z)^2 G\right\}$$

$$-3\frac{1}{r^5}H + 15\frac{b-y}{r^7}\left\{(b-y)H + (c-z)K\right\} + 15\frac{a-x}{r^7}\left\{(a-x)H + (c-z)J\right\} - 105\frac{(a-x)(b-y)}{r^9}\left\{(a-x)(b-y)H + (b-y)(c-z)J + (c-z)(a-x)K\right\}$$

$x, y, z = 0 \qquad b = 0 \qquad c = 0 \qquad a = +r$

$$\frac{\partial^2 V}{\partial x^2} = +\frac{6}{r^4}A - \frac{12}{r^5}E$$

$$\frac{\partial^2 V}{\partial y^2} = -\frac{3}{r^4}A - \frac{2}{r^5}F + \frac{5}{r^5}E$$

$$\frac{\partial^2 V}{\partial z^2} = -\frac{3}{r^4}A - \frac{2}{r^5}G + \frac{5}{r^5}E$$

$$\frac{\partial^2 V}{\partial x \partial z} = -\frac{3}{r^4}C + \frac{12}{r^5}K$$

$$\frac{\partial^2 V}{\partial y \partial z} = -\frac{3}{r^5}J$$

$$\frac{\partial^2 V}{\partial x \partial y} = -\frac{3}{r^4}B + \frac{12}{r^5}H$$

$b = 0 \qquad c = 0 \qquad a = -r$

$$\frac{\partial^2 V}{\partial x^2} = -\frac{6}{r^4}A - \frac{12}{r^5}E$$

$$\frac{\partial^2 V}{\partial y^2} = +\frac{3}{r^4}A - \frac{2}{r^5}F + \frac{5}{r^5}E$$

$$\frac{\partial^2 V}{\partial z^2} = +\frac{3}{r^4}A - \frac{2}{r^5}G + \frac{5}{r^5}E$$

$$\frac{\partial^2 V}{\partial x \partial z} = +\frac{3}{r^4}C + \frac{12}{r^5}K$$

$$\frac{\partial^2 V}{\partial y \partial z} = -\frac{3}{r^5}J$$

$$\frac{\partial^2 V}{\partial x \partial y} = +\frac{3}{r^4}B + \frac{12}{r^5}H$$

$$E + F + G = 0$$

$x\ y\ z = 0 \qquad a = 0 \qquad b = +r \qquad c = 0$

$b = -r$

$$\frac{\partial^2 V}{\partial x^2} = +\frac{3}{r^4}B - \frac{2}{r^5}E + 5 \qquad -\frac{3}{r^4}B$$

$$\frac{\partial^2 V}{\partial y^2} =$$

$$\frac{\partial^2 V}{\partial z^2} =$$

$$\frac{\partial^2 V}{\partial x \partial z}$$

V

$$V = \int \alpha \frac{\partial\left(\frac{1}{r}\right)}{\partial x} d\tau + \int \beta \frac{\partial \frac{1}{r}}{\partial y} d\tau + \int \gamma \frac{\partial \frac{1}{r}}{\partial z} d\tau$$

tesszük $x, y, z = 0$ $\quad a = a + \xi_0 \quad b = b + \eta_0 \quad c = c + \zeta_0$

és a ξ_0 η_0 ζ_0 magasabb hatványait elhanyagoljuk

$$\frac{1}{r^3} = \frac{1}{(a^2+b^2+c^2)^{\frac{3}{2}}} - 3\frac{a\xi + b\eta + c\zeta}{(a^2+b^2+c^2)^{\frac{5}{2}}}$$

$$\frac{1}{r^5} = \frac{1}{(a^2+b^2+c^2)^{\frac{5}{2}}} - 5\frac{a\xi + b\eta + c\zeta}{(a^2+b^2+c^2)^{\frac{7}{2}}}$$

$$\frac{1}{r^7} = \frac{1}{(a^2+b^2+c^2)^{\frac{7}{2}}} - 7\frac{a\xi + b\eta + c\zeta}{(a^2+b^2+c^2)^{\frac{9}{2}}}$$

$$\frac{1}{r}$$

$$\cancel{V = \frac{a}{(a^2+b^2+c^2)^{\frac{3}{2}}}\int \alpha\, d\tau - \frac{3a^2}{(\;)^{\frac{5}{2}}}\int \xi\alpha\, d\tau - \frac{3ab}{(\;)^{\frac{5}{2}}}\int \eta\alpha\, d\tau - \frac{3ac}{(\;)^{\frac{5}{2}}}\int \zeta\alpha\, d\tau + \frac{3}{(\;)^{\frac{3}{2}}}\int \xi\alpha\, d\tau}$$

$$\cancel{V = \int \alpha\, d\tau \frac{a+\xi}{(\;)^{\frac{3}{2}}}} - 3$$

$$V = \frac{1}{(\;)^{\frac{3}{2}}}\int \alpha\, d\tau\,(a+\xi) - \frac{3}{(\;)^{\frac{5}{2}}}\int \alpha\, d\tau\,(a+\xi)(a\xi + b\eta + c\zeta)$$
$$+ \frac{1}{(\;)^{\frac{3}{2}}}\int \beta\, d\tau\,(b+\xi) - \frac{3}{(\;)^{\frac{5}{2}}}\int \beta\, d\tau\,(b+\eta)(a\xi + b\eta + c\zeta)$$
$$+ \frac{1}{(\;)^{\frac{3}{2}}}\int \gamma\, d\tau\,(c+\zeta) - \frac{3}{(\;)^{\frac{5}{2}}}\int \gamma\, d\tau\,(c+\zeta)(a\xi + b\eta + c\zeta)$$

$$V = \frac{a}{(\;)^{\frac{3}{2}}}\int \alpha\, d\tau + \frac{b}{(\;)^{\frac{3}{2}}}\int \beta\, d\tau + \frac{c}{(\;)^{\frac{3}{2}}}\int \gamma\, d\tau$$
$$+ \frac{2a^2 - b^2 - c^2}{(\;)^{\frac{5}{2}}}\int \xi\alpha\, d\tau - \frac{3ab}{(\;)^{\frac{5}{2}}}\int \eta\alpha\, d\tau - \frac{3ac}{(\;)^{\frac{5}{2}}}\int \zeta\alpha\, d\tau$$
$$- \frac{3ab}{(\;)^{\frac{5}{2}}}\int \xi\beta\, d\tau - \frac{2b^2 - a^2 - c^2}{(\;)^{\frac{5}{2}}}\int \beta\eta\, d\tau - \frac{3bc}{(\;)^{\frac{5}{2}}}\int \beta\zeta\, d\tau$$
$$- \frac{3ac}{(\;)^{\frac{5}{2}}}\int \xi\gamma\, d\tau - \frac{3bc}{(\;)^{\frac{5}{2}}}\int \gamma\eta\, d\tau - \frac{2c^2 - a^2 - b^2}{(\;)^{\frac{5}{2}}}\int \gamma\zeta\, d\tau$$

$\int \alpha \, d\tau$ $\varphi = 0$ $\int \alpha \xi \, d\tau$ $\varphi = \pi$ $\int \alpha \xi^2 \, d\tau$

$\xi = \xi_0 \cos\lambda - \eta_0 \sin\lambda$

$\eta = \xi_0 \sin\lambda + \eta_0 \cos\lambda$

$\zeta = \zeta_0$

$\xi' = -\xi_0 \cos\lambda - \eta_0 \sin\lambda$

$\eta' = -\xi_0 \sin\lambda + \eta_0 \cos\lambda$

$\zeta' = -\zeta_0$

Állandó mágnesség

$d\mu_\alpha = d\mu_{\alpha_0} \cos\lambda - d\mu_{\beta_0} \sin\lambda$

$d\mu_\beta = d\mu_{\alpha_0} \sin\lambda + d\mu_{\beta_0} \cos\lambda$

$d\mu_\gamma = d\mu_{\gamma_0}$

$d\mu'_\alpha = -d\mu_{\alpha_0} \cos\lambda - d\mu_{\beta_0} \sin\lambda$

$d\mu'_\beta = -d\mu_{\alpha_0} \sin\lambda + d\mu_{\beta_0} \cos\lambda$

$d\mu'_\gamma = -d\mu_{\gamma_0}$

$d\mu_{\alpha_0} = \alpha_0 \, d\tau$ etc.

Egynemű influentia.

$d\mu_\alpha = Hk \, d\tau$

$d\mu_\beta = 0$

$d\mu_\gamma = Vk \, d\tau$

~~Változó~~ irányitott influentia.

$d\mu_\alpha = p \, d\tau (H \cos^2 a_0 \cos^2\lambda + H \cos^2 b_0 \sin^2\lambda$
$- H \cos a_0 \cos b_0 \sin 2\lambda$
$+ V \cos a_0 \cos c_0 \cos\lambda - V \cos b_0 \cos c_0 \sin\lambda$

$d\mu'_\alpha = p \, d\tau (H \cos^2 a_0 \cos^2\lambda + H \cos^2 b \sin^2\lambda$
$+ H \cos a_0 \cos b_0 \sin 2\lambda$
$+ V \cos a_0 \cos c_0 \cos\lambda + V \cos b_0 \cos c_0 \sin\lambda$

900
81000 8100
729000 81

$r^4 = 60 \, m$ 64 8 6 5,61 0000

2

$\frac{1}{360000}$ 0,000015

0,000003
2

$\frac{6\mu}{r^4} = \frac{1}{10 \, m}$

$+\frac{3}{r^5} \quad -15\frac{(b-y)^2}{r^7} - 15\frac{(a-x)^2}{r^7} + 105\frac{(a-x)^2(b-y)^2}{r^7}$

$\xi = \xi_0 \cos\alpha - \eta_0 \sin\alpha$

$\xi' = -\xi_0 \cos\alpha - \eta_0 \sin\alpha.$

$\frac{-15}{r^7} + 15\frac{(c-z)^2}{r^7}$

$-105 \frac{abc}{r^9}$

-210

$d\mu_\alpha = d\mu_\alpha \cos\alpha - d\mu_\beta \sin\alpha$

$d\mu_\alpha' = d\mu_\alpha \cos\alpha - d\mu_\beta \sin\alpha.$

$-45\frac{(a-x)^2}{r^7} - 45\frac{(a-x)^2}{r^7}$

$\cancel{+105\frac{a-x}{r^7}}$

$+15\frac{a}{r^7} - 105\frac{(a-x)(c-z)^2}{r^9} - 105\frac{(a-x)(b-y)^2}{r^9}$

$-315\frac{(a-x)(b-y)^2}{r^9} - 315\frac{(a-x)(b-y)^2}{r^9}$

$-90\frac{a}{r^7} + 105\frac{(a-x)^3}{r^9} +$

$+105\frac{(a-x)(c-z)^2}{r^9}$

$+45 + 180$

$+105\, a-x \quad 2\, b-y^2$

$-60\frac{c-z}{r^7} \quad -30$

-630

420

$\partial p_2 \xi d\int \frac{\partial d}{\partial t \partial z} + \partial p_1 \xi d \int \frac{\partial d}{\partial y} + \partial p_0 \xi d \int \frac{\partial d}{\partial z} - \partial p \xi \xi d \int \frac{\partial d}{\partial t} + \partial p \xi \xi x \int \frac{\partial d}{\partial y} -$

$$\cancel{+\frac{12}{r^7}\{\ \}}$$

$$-\frac{2}{r^5}\mathcal{E} + \frac{5}{r^7}\{\ \} - 35\frac{(a-x)^2}{r^9}\{\ \} + 10\frac{(a-x)^2}{r^7}\mathcal{E} + 10\frac{(a-x)^2}{r^7}\mathcal{E}$$

$$-\frac{2}{r^5}F + \frac{5}{r^7}\{\ \} - 35\frac{(b-y)^2}{r^9}\{\ \} + 10\frac{(b-y)^2}{r^7}F + 10\frac{(b-y)^2}{r^7}J$$

— — — — —

$$\cancel{-\frac{2}{r^5}(\mathcal{E}+F+G) + \frac{5}{r^7}\{\mathcal{E}+F+G\}} - \frac{35}{r^7}\{\ \} + \frac{20}{r^7}\{\ \}$$

$$\cancel{\frac{25}{r^7}\{\ \} - \frac{35}{r^7}}$$

$$-\frac{2}{r^5}(\mathcal{E}+F+G) + 75$$

$$(a-x)(b-y)H + (b-y)(c-z)J + (a-x)(c-z)K$$

$$+15\frac{(a-x)}{r^7}\{(b-y)H + (c-z)K\}$$

$$\left.\begin{array}{l} +15\frac{1}{r^7}[\ \ ] \\ -105\frac{(a-x)^2}{r^9}[\ \ ] \end{array}\right\} -60\frac{1}{r^7}[\ \ ]$$

$$+15\frac{(a-x)}{r^7}\{(b-y)H + (c-z)K\}$$

$$+30\frac{(a-x)}{r^7}\{(b-y)H + (c-z)K\}$$

~~$\int \mu_\alpha dt$~~

$$\int \alpha\, dt = \mu_{\alpha_0} \cos\varphi - \mu_{\gamma_0} \sin\varphi .$$

$$\int \xi \alpha\, dt = \cos^2\varphi \cos^2\lambda \int \xi_0 \mu_{\alpha_0}$$

$$\int \xi \alpha\, dt = \cos^2\varphi \cos^2\lambda\, \xi_0 \mu_{\xi_0} - \tfrac{1}{2} \sin 2\varphi \cos^2\lambda\, \xi_0 \mu_{\zeta_0} - \tfrac{1}{2} \cos\varphi \sin 2\lambda\, \xi_0 \mu_{\eta_0}$$
$$- \tfrac{1}{2} \sin 2\varphi \cos^2\lambda\, \zeta_0 \mu_{\xi_0} + \sin^2\varphi \cos^2\lambda\, \zeta_0 \mu_{\zeta_0} + \tfrac{1}{2} \sin\varphi \sin 2\lambda\, \zeta_0 \mu_{\eta_0}$$
$$- \tfrac{1}{2} \cos\varphi \sin 2\lambda\, \eta_0 \mu_{\xi_0} + \tfrac{1}{2} \sin\varphi \sin 2\lambda\, \eta_0 \mu_{\zeta_0} + \sin^2\lambda\, \eta_0 \mu_{\eta_0}$$

$$\int \xi \alpha\, dt = \cos^2\varphi \cos^2\lambda \int \xi_0 \alpha_0\, dt + \sin^2\varphi \cos^2\lambda \int \zeta_0 \gamma_0\, dt + \sin^2\lambda \int \eta_0 \beta_0\, dt$$

$(1 - \sin^2\varphi)(1 - \sin^2\lambda)\, a$

$\sin^2\varphi\, (1 - \sin^2\lambda)\, b$

$\sin^2\lambda\, c$

$a - \sin^2\lambda\, a - \sin^2\varphi\, a + \sin^2\varphi \sin^2\lambda\, a$

$1 \quad$ ~~$\sin^2\varphi\, b$~~

$b - \sin^2\lambda\, b - \cos^2\varphi\, b - \cos^2\varphi \sin^2\lambda\, b$

$+ \sin^2\lambda\, c$

$\sin^2\lambda\, (c - a - b) \quad \cos^2\varphi\, (a + b)$

$$r = +a \qquad b = 0 \qquad c = 0$$

$$\frac{\partial^2 V}{\partial x^2} = +\frac{6}{r^4}\int \alpha\, d\tau - \frac{24}{r^5}\int \alpha\xi\, d\tau + \frac{12}{r^5}\int \beta\eta\, d\tau + \frac{12}{r^5}\int \gamma\zeta\, d\tau$$

$$+\frac{60}{r^6}\int \alpha\xi^2\, d\tau - \frac{30}{r^6}\int \alpha\eta^2\, d\tau - \frac{30}{r^6}\int \alpha\zeta^2\, d\tau - \frac{60}{r^6}\int \beta\xi\eta\, d\tau - \frac{60}{r^6}\int \gamma\xi\zeta\, d\tau$$

$$\frac{\partial^2 V}{\partial x \partial z} = -\frac{3}{r^4}\int \gamma\, d\tau + \frac{12}{r^5}\int \alpha\zeta\, d\tau + \frac{12}{r^5}\int \gamma\xi\, d\tau$$

$$-\frac{60}{r^6}\int \alpha\xi\zeta\, d\tau + \frac{15}{r^6}\int \beta\eta\zeta\, d\tau - \frac{30}{r^6}\int \gamma\xi^2\, d\tau + \frac{1}{2}\frac{15}{r^6}\int \gamma\eta^2\, d\tau + \frac{1}{2}\frac{45}{r^6}\int \gamma\zeta^2\, d\tau$$

$$r = +b \qquad a = 0 \qquad c = 0$$

$$\frac{\partial^2 V}{\partial x^2} = -\frac{3}{r^4}\int \beta\, d\tau - \frac{9}{r^5}\int \alpha\xi\, d\tau + \frac{12}{r^5}\int \beta\eta\, d\tau + \frac{12}{r^5}\int \gamma\zeta\, d\tau$$

$$+\frac{45}{r^6}\int \alpha\xi\eta\, d\tau + \frac{145}{2r^6}\int \beta\xi^2\, d\tau - \frac{30}{r^6}\int \beta\eta^2\, d\tau + \frac{1}{2}\frac{15}{r^6}\int \beta\zeta^2\, d\tau + \frac{15}{r^6}\int \gamma\eta\zeta\, d\tau$$

$$\frac{\partial^2 V}{\partial x \partial z} = -\frac{3}{r^5}\int \alpha\zeta\, d\tau - \frac{3}{r^5}\int \gamma\xi\, d\tau$$

$$+\frac{1}{2}\frac{45}{r^6}\int \alpha\xi^2\, d\tau + \frac{15}{r^6}\int \alpha\eta\zeta\, d\tau + \frac{15}{r^6}\int \beta\xi\zeta\, d\tau + \frac{15}{r^6}\int \gamma\xi\eta\, d\tau$$

$r = -a \qquad b = 0 \qquad c = 0$

$$\frac{\partial^2 V}{\partial x^2} = -\frac{6}{r^4}\int \alpha\, d\tau - \frac{24}{r^5}\int \alpha\xi\, d\tau + \frac{12}{r^5}\int \beta\eta\, d\tau + \frac{12}{r^5}\int \gamma\zeta\, d\tau$$

$$-\frac{60}{r^6}\int \alpha\xi^2 d\tau + \frac{30}{r^6}\int \alpha\eta^2 d\tau + \frac{30}{r^6}\int \alpha\zeta^2 d\tau + \frac{60}{r^6}\int \beta\xi\eta\, d\tau + \frac{60}{r^6}\int \gamma\xi\zeta\, d\tau$$

$$\frac{\partial^2 V}{\partial x \partial z} = +\frac{3}{r^4}\int \gamma\, d\tau + \frac{12}{r^5}\int \alpha\zeta\, d\tau + \frac{12}{r^5}\int \gamma\xi\, d\tau$$

$\gamma\xi^2 d\tau$

$$\frac{\partial^2 V}{\partial y \partial z} = +\frac{60}{r^6}\int \alpha\xi\zeta\, d\tau - \frac{15}{r^6}\int \beta\eta\zeta\, d\tau + \frac{30}{r^6}\int \gamma\xi^2 d\tau - \frac{1}{2}\frac{15}{r^6}\int \gamma\eta^2 d\tau - \frac{1}{2}\frac{45}{r^6}\int \gamma\zeta^2 d\tau$$

$r = -b \qquad a = 0 \qquad c = 0$

$$\frac{\partial^2 V}{\partial x^2} = +\frac{3}{r^4}\int \beta\, d\tau - \frac{9}{r^5}\int \alpha\xi\, d\tau + \frac{12}{r^5}\int \beta\eta\, d\tau + \frac{12}{r^5}\int \gamma\zeta\, d\tau$$

$$\cancel{\frac{\partial^2 V}{\partial x \partial y}} = +\frac{45}{r^6}\int \alpha\xi\eta\, d\tau - \frac{1}{2}\cdot\frac{45}{r^6}\int \beta\xi^2 d\tau + \frac{30}{r^6}\int \beta\eta^2 d\tau - \frac{1}{2}\frac{15}{r^6}\int \beta\zeta^2 d\tau - \frac{15}{r^6}\int \gamma\eta\zeta\, d\tau$$

$$\frac{\partial^2 V}{\partial x \partial z} = -\frac{3}{r^5}\int \alpha\zeta\, d\tau - \frac{3}{r^5}\int \gamma\xi\, d\tau$$

$$\cancel{\frac{\partial^2 V}{\partial y \partial z}} = -\frac{1}{2}\frac{45}{r^6}\int \alpha\xi^2 d\tau + \frac{15}{r^6}\int \alpha\eta\zeta\, d\tau + \frac{15}{r^6}\int \beta\xi\zeta\, d\tau + \frac{15}{r^6}\int \gamma\xi\zeta\, d\tau$$

$$r = +a \qquad b = 0 \qquad c = 0$$

$$\frac{\partial^2 V}{\partial x \partial y} = -\frac{3}{r^4}\int \beta \, d\tau + \frac{12}{r^5}\int \alpha\eta \, d\tau + \frac{12}{r^5}\int \beta\xi \, d\tau$$
$$-\frac{60}{r^6}\int \alpha\xi\eta \, d\tau - \frac{30}{r^6}\int \beta\xi^2 d\tau + \frac{1}{2}\frac{45}{r^6}\int \beta\eta^2 d\tau + \frac{1}{2}\frac{15}{r^6}\int \beta\zeta^2 d\tau + \frac{15}{r^6}\int \gamma\eta\zeta \, d\tau$$

$$\frac{\partial^2 V}{\partial y \partial z} = -\frac{3}{r^5}\int \beta\zeta \, d\tau - \frac{3}{r^5}\int \gamma\eta \, d\tau$$
$$+\frac{15}{r^6}\int \alpha\eta\zeta \, d\tau + \frac{15}{r^6}\int \beta\xi\zeta \, d\tau + \frac{15}{r^6}\int \gamma\xi\eta \, d\tau$$

$$r = +b \qquad a = 0 \qquad c = 0$$

$$\frac{\partial^2 V}{\partial x \partial y} = -\frac{3}{r^4}\int \alpha \, d\tau + \frac{12}{r^5}\int \alpha\eta \, d\tau + \frac{12}{r^5}\int \beta\xi \, d\tau$$
$$+\frac{1}{2}\frac{45}{r^6}\int \alpha\xi^2 d\tau - \frac{30}{r^6}\int \alpha\eta^2 d\tau + \frac{1}{2}\frac{15}{r^6}\int \alpha\zeta^2 d\tau - \frac{60}{r^6}\int \beta\xi\eta \, d\tau + \frac{15}{r^6}\int \gamma\xi\zeta \, d\tau$$

$$\frac{\partial^2 V}{\partial y \partial z} = -\frac{3}{r^4}\int \gamma \, d\tau + \frac{12}{r^5}\int \beta\zeta \, d\tau + \frac{12}{r^5}\int \gamma\eta \, d\tau$$
$$+\frac{15}{r^6}\int \alpha\xi\zeta \, d\tau - \frac{60}{r^6}\int \beta\xi\zeta \, d\tau - \frac{1}{2}\frac{15}{r^6}\int \gamma\xi^2 d\tau + \frac{30}{r^6}\int \gamma\eta^2 d\tau - \frac{1}{2}\frac{45}{r^6}\int \gamma\zeta^2 d\tau$$

$r = -a \qquad b = 0 \qquad c = 0$

$$\frac{\partial^2 V}{\partial x \partial y} = + \frac{3}{r^4}\int \beta \, d\tau + \frac{12}{r^5}\int \alpha\eta \, d\tau + \frac{12}{r^5}\int \beta\xi \, d\tau$$
$$+ \frac{60}{r^6}\int \alpha\xi\eta \, d\tau + \frac{30}{r^6}\int \beta\xi^2 \, d\tau - \frac{1}{2}\frac{45}{r^6}\int \beta\eta^2 \, d\tau - \frac{1}{2}\frac{15}{r^6}\int \beta\zeta^2 \, d\tau - \frac{15}{r^6}\int \gamma\eta\zeta \, d\tau$$

$$\frac{\partial^2 V}{\partial y \partial z} = - \frac{3}{r^5}\int \beta\zeta \, d\tau - \frac{3}{r^5}\int \gamma\eta \, d\tau$$
$$- \frac{15}{r^6}\int \alpha\eta\zeta \, d\tau - \frac{15}{r^6}\int \beta\xi\zeta \, d\tau - \frac{15}{r^6}\int \gamma\xi\eta \, d\tau$$

$r = -b \qquad a = 0 \qquad c = 0$

$$\frac{\partial^2 V}{\partial x \partial y} = + \frac{3}{r^4}\int \beta \, d\tau + \frac{12}{r^5}\int \alpha\eta \, d\tau + \frac{12}{r^5}\int \beta\xi \, d\tau$$
$$- \frac{1}{2}\frac{45}{r^6}\int \alpha\xi^2 \, d\tau + \frac{30}{r^6}\int \alpha\eta^2 \, d\tau - \frac{1}{2}\frac{15}{r^6}\int \alpha\zeta^2 \, d\tau + \frac{60}{r^6}\int \beta\xi\eta \, d\tau - \frac{15}{r^6}\int \gamma\xi\zeta \, d\tau$$

$$\frac{\partial^2 V}{\partial y \partial z} = + \frac{3}{r^4}\int \gamma \, d\tau + \frac{12}{r^5}\int \beta\zeta \, d\tau + \frac{12}{r^5}\int \gamma\eta \, d\tau$$
$$- \frac{15}{r^6}\int \alpha\xi\zeta \, d\tau - \frac{60}{r^6}\int \beta\xi\zeta \, d\tau - \frac{1}{2}\frac{15}{r^6}\int \gamma\xi^2 \, d\tau + \frac{30}{r^6}\int \gamma\eta^2 \, d\tau - \frac{1}{2}\frac{45}{r^6}\int \gamma\zeta^2 \, d\tau$$

$$\varphi = 0$$

$$\begin{cases} \xi = \xi_0 \cos\lambda - \eta_0 \sin\lambda \\ \eta = \xi_0 \sin\lambda + \eta_0 \cos\lambda \\ \zeta = \zeta_0 \end{cases}$$

$$\xi^2 = \xi_0^2 \cos^2\lambda + \eta_0^2 \sin^2\lambda - \xi_0\eta_0 \sin 2\lambda$$

$2\sin\lambda\cos\lambda$

$2\cos\lambda - \frac{1}{2}\cos 3\lambda - \frac{3}{2}\cos\lambda$

$$\begin{cases} \alpha = \alpha_0 \cos\lambda - \beta_0 \sin\lambda \\ \beta = \alpha_0 \sin\lambda + \beta_0 \cos\lambda \\ \gamma = \gamma_0 \end{cases}$$

$$\alpha\xi^2 = \alpha_0 \xi_0^2 \cos^3\lambda + \alpha_0\eta_0^2 \cos\lambda \sin^2\lambda - \alpha_0 \xi_0\eta_0 \sin 2\lambda - \beta_0 \xi_0^2 \sin\lambda\cos^2\lambda - \beta_0 \eta_0^2 \sin^3\lambda + \beta_0\xi_0\eta_0 \sin 2\lambda \sin\lambda$$

$$+\frac{1}{4}\cos 3\lambda + \frac{3}{4}\cos\lambda \quad \Big| \quad +\frac{1}{4}\cos\lambda - \frac{1}{4}\cos 3\lambda \quad \Big| \quad +\frac{1}{4}\sin\lambda + \frac{1}{4}\sin 3\lambda \quad \Big| \quad -\frac{1}{4}\sin 3\lambda + \frac{3}{4}\sin\lambda \quad \Big| \quad +\frac{1}{2}\cos\lambda - \frac{1}{2}\cos 3\lambda$$

$$\int \alpha\xi^2 d\tau = \left(-\frac{1}{4}\int \beta_0\xi_0^2 d\tau - \frac{3}{4}\int \beta_0\eta_0^2 d\tau\right)\sin\lambda + \left(+\frac{1}{4}\int \alpha_0\eta_0^2 d\tau + \frac{3}{4}\int \alpha_0\xi_0^2 + \frac{1}{2}\int \beta_0\xi_0\eta_0 d\tau\right)\cos\lambda$$

$$-\int \alpha_0\xi_0\eta_0 d\tau \cdot \sin 2\lambda$$

$$+\left(-\frac{1}{4}\int \beta_0\xi_0^2 d\tau + \frac{1}{4}\int \beta_0\eta_0^2 d\tau\right)\sin 3\lambda + \left(\frac{1}{4}\int \alpha_0\xi_0^2 d\tau - \frac{1}{4}\int \alpha_0\eta_0^2 d\tau - \frac{1}{2}\int \beta_0\xi_0\eta_0 d\tau\right)$$

$$\cos 3\lambda.$$

$$\varphi = \pi$$

$$\begin{cases} \xi' = -\xi_0 \cos\lambda - \eta_0 \sin\lambda \\ \eta' = -\xi_0 \sin\lambda + \eta_0 \cos\lambda \\ \zeta' = \zeta_0 \end{cases}$$

$$\xi'^2 = \xi_0^2 \cos^2\lambda + \eta_0^2 \sin^2\lambda + \xi_0 \eta_0 \sin 2\lambda$$

$$\begin{cases} \alpha' = -\alpha_0 \cos\lambda - \beta_0 \sin\lambda \\ \beta' = -\alpha_0 \sin\lambda + \beta_0 \cos\lambda \\ \gamma' = \gamma_0 \end{cases}$$

$$\alpha' \xi'^2 = -\alpha_0 \xi_0^2 \cos^3\lambda - \alpha_0 \eta_0^2 \cos\lambda \sin^2\lambda - \alpha_0 \xi_0 \eta_0 \cos\lambda \sin 2\lambda - \beta_0 \xi_0^2 \sin\lambda \cos^2\lambda - \beta_0 \eta_0^2 \sin^3\lambda - \beta_0 \xi_0 \eta_0 \sin 2\lambda \sin\lambda$$

$$\xi = \xi_0 \cos\varphi \cos\lambda - \zeta_0 \sin\varphi \cos\lambda - \eta_0 \sin\lambda$$

Alenta

$$\eta = \xi_0 \cos\varphi \sin\lambda - \zeta_0 \sin\varphi \sin\lambda + \eta_0 \cos\lambda$$

$$\zeta = \xi_0 \sin\varphi + \zeta_0 \cos\varphi$$

állandó nyomaték

$$d\mu_\alpha = d\mu_{\alpha_0} \cos\varphi \cos\lambda - d\mu_{\gamma_0} \sin\varphi \cos\lambda - d\mu_{\beta_0} \sin\lambda = \alpha\, d\tau$$

$$d\mu_\beta = d\mu_{\alpha_0} \cos\varphi \sin\lambda - d\mu_{\gamma_0} \sin\varphi \sin\lambda + d\mu_{\beta_0} \cos\lambda = \beta\, d\tau$$

$$d\mu_\gamma = d\mu_{\alpha_0} \sin\varphi + d\mu_{\gamma_0} \cos\varphi = \gamma\, d\tau$$

Egyenes indukció

$$d\mu_\alpha = H k\, d\tau$$

$$d\mu_\beta = 0$$

$$d\mu_\gamma = V k\, d\tau$$

Indukció iránya a, b c

$$\cos a = \cos a_0 \cos\varphi \cos\lambda - \cos c_0 \sin\varphi \cos\lambda - \cos b_0 \sin\lambda$$

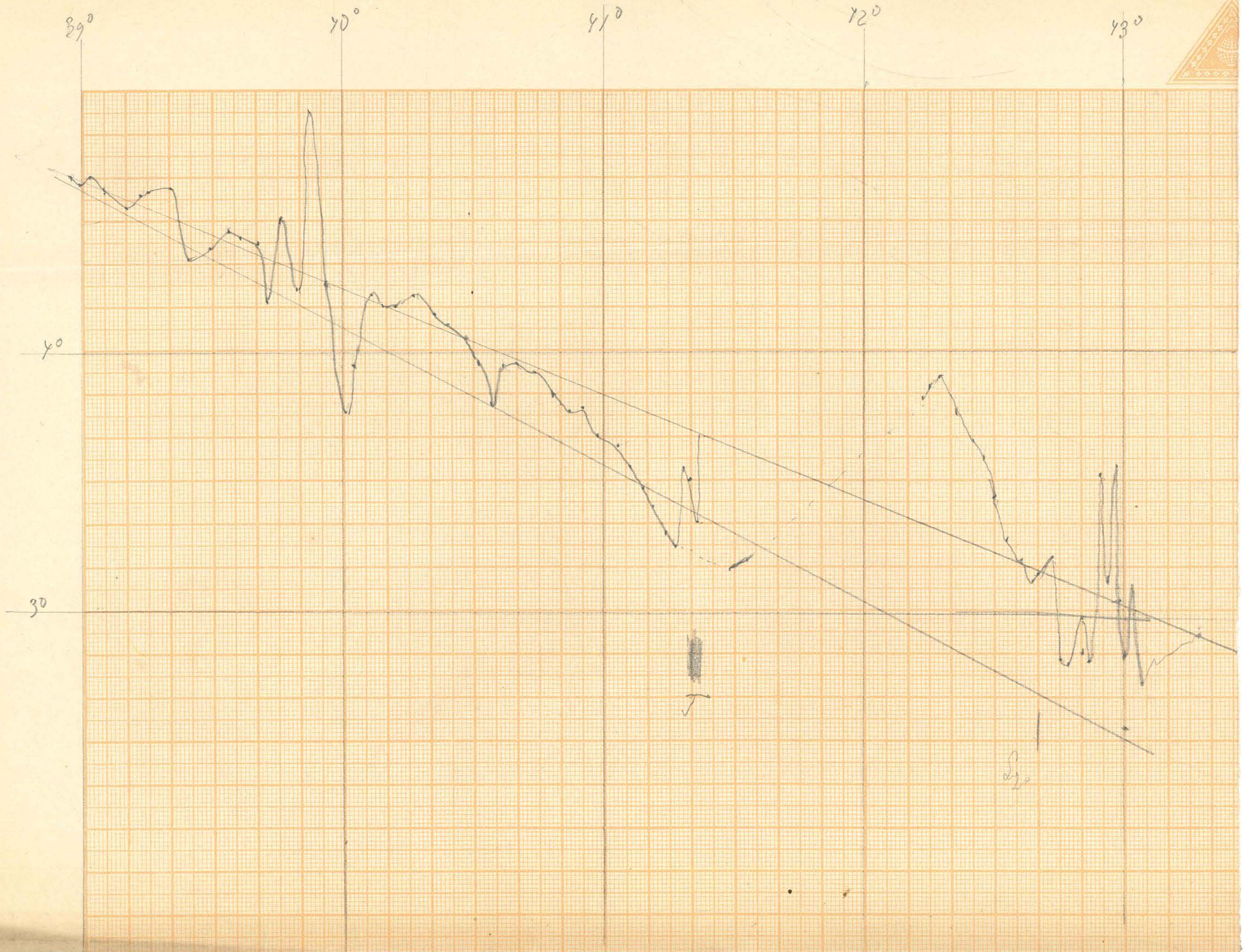
$$\cos b = \cos a_0 \cos\varphi \sin\lambda - \cos c_0 \sin\varphi \sin\lambda + \cos b_0 \cos\lambda$$

$$\cos c = \cos a_0 \sin\varphi + \cos c_0 \cos\varphi$$

$$d\mu_a = p\, d\tau\, (H \cos a + V \cos c) \cos a$$

$$d\mu_b = p\, d\tau\, (H \cos a + V \cos c) \cos b$$

$$d\mu_c = p\, d\tau\, (H \cos a + V \cos c) \cos c$$


39°
40°
41°
42°
43°
40
30

Mercury ξ_0

$$\xi_0 = \xi_0^1 \cos\varphi - \zeta^0 \sin\varphi$$
$$\zeta_0 = \xi^0 \sin\varphi + \zeta^0 \cos\varphi.$$
$$\eta_0 = \eta_0^1$$

$$\xi = \xi_0^1 \cos\varphi\cos\lambda - \zeta_0^1 \sin\varphi\cos\lambda - \eta_0^1 \sin\lambda$$
$$\eta = \xi_0^1 \cos\varphi\sin\lambda + \zeta_0^1 \sin\varphi\sin\lambda + \eta_0^1 \cos\lambda$$
$$\zeta = \xi_0^1 \sin\varphi + \zeta_0^1 \cos\varphi$$

$$K_\xi = \mu_0^1 \cos\varphi\cos\lambda - \mu_\zeta^1 \sin\varphi\cos\lambda - \eta_0^1 \sin\lambda$$

11 12 13
~~21~~ 22 23
~~31~~ ~~32~~ 33

6 3

[illegible] II

ξ	$\alpha = \cos i$	$\alpha' = \cos v \cos l$
η	$\beta = 0$	$\beta' = \cos v \sin l$
ζ	$\gamma = \sin i$	$\gamma' = \sin v$

$\cos^2 v$
$\cos 2v = \cos^2 v - \sin^2 v$
$\cos 2v = 2\cos^2 v - 1$
$\cos^2 v = \frac{1}{2} + \frac{1}{2}\cos 2v$
$\sin^2 v = \frac{1}{2} - \frac{1}{2}\cos 2v$

$$\mu_i = J \cos i \cos v \cos l + J \sin i \sin v$$
$$\mu_i = H \cos v \cos l + V \sin v$$

$$\mu_x = H \cos^2 v \cos^2 l + V \sin v \cos v \cos l$$
$$\mu_y = H \cos^2 v \sin l \cos l + V \sin v \cos v \sin l$$
$$\mu_z = H \sin v \cos v \cos l + V \sin^2 v$$

$$\mu_x = \frac{1}{2} H \cos^2 l + \frac{1}{2} H \cos^2 l \cos 2(v+\varphi) + \frac{1}{2} \sin 2(v+\varphi) \cos l$$
$$\mu_y = \frac{1}{2} H \sin 2l + \frac{1}{4} H \sin 2l \cos 2(v+\varphi) + \frac{1}{2} \sin 2(v+\varphi) \sin l$$
$$\mu_z = \frac{1}{2} H \sin 2v \cos l + \frac{V}{2} - \frac{1}{2} V \cos 2(v+\varphi)$$

$$\mu_x = \frac{1}{2}$$

$$V = \frac{a}{r^3}\int \alpha\, d\tau + \frac{b}{r^3}\int \beta\, d\tau + \frac{c}{r^3}\int \gamma\, d\tau$$

$$\left(+\frac{1}{r^3} - 3\frac{a^2}{r^5}\right)\int \alpha\xi\, d\tau - 3\frac{ab}{r^5}\int \alpha\eta\, d\tau - 3\frac{ac}{r^5}\int \alpha\zeta\, d\tau$$

$$-3\frac{ab}{r^5}\int \beta\xi\, d\tau + \left(\frac{1}{r^3} - 3\frac{b^2}{r^5}\right)\int \beta\eta\, d\tau - 3\frac{bc}{r^5}\int \beta\zeta\, d\tau$$

$$-3\frac{ac}{r^5}\int \gamma\xi\, d\tau - 3\frac{bc}{r^5}\int \gamma\eta\, d\tau + \left(\frac{1}{r^3} - 3\frac{c^2}{r^5}\right)\int \gamma\zeta\, d\tau$$

$$+\frac{60}{r^6}\int \alpha\xi^2\, d\tau - \frac{30}{r^6}\int \alpha\eta^2\, d\tau - \frac{30}{r^6}\int \alpha\zeta^2\, d\tau$$

$$\frac{\partial^2 V}{\partial x^2}.$$

$$+\frac{1}{2}\frac{\partial^5 \frac{1}{r}}{\partial x^5}\int \alpha\xi^2\, d\tau + \frac{1}{2}\frac{\partial^5 \frac{1}{r}}{\partial y^2 \partial x^3}\int \alpha\eta^2\, d\tau + \frac{1}{2}\frac{\partial^5 \frac{1}{r}}{\partial z^2 \partial x^3}\int \alpha\zeta^2 d\tau + \frac{\partial^5 \frac{1}{r}}{\partial x^4 \partial y}\int \alpha\xi\eta\, d\tau$$

$$+\frac{\partial^5 (\frac{1}{r})}{\partial x^3 \partial y \partial z}\int \alpha\eta\zeta\, d\tau + \frac{\partial^5 \frac{1}{r}}{\partial x^4 \partial z}\int \alpha\xi\zeta\, d\tau.$$

585

$$\frac{112{,}5}{r^6} - \frac{525}{r^6} + \frac{472{,}5}{r^6}$$

112.5

$A = xy$

$B = k + x^2$

$C = k + y^2$

$B - C = x^2 - y^2$

$A = xy$

$$\cos a = \cos a_0 \cos d - \cos b_0 \sin d$$

$$\cos b = \cos a_0 \sin d + \cos b_0 \cos d$$

$$\cos c = \cos c_0$$

$$\cos a' = -\cos a_0 \cos d - \cos b_0 \sin d$$

$$\cos b' = -\cos a_0 \cos d + \cos b_0 \sin d$$

$$\cos c' = \cos c_0$$

$$dp_a = p\, d\tau\, (H \cos^2 a + V \cos a \cos c)$$

$$dp_b = p\, d\tau\, (H \cos a \cos b + V \cos c \cos b)$$

$$dp_c = p\, d\tau\, (H \cos a \cos c + V \cos c^2)$$

$\frac{1}{2000}$

300.000 000.000.000

$X = \alpha A$

~~Xz~~

$$A = \alpha\frac{\partial X}{\partial x} + \beta\frac{\partial X}{\partial y} + \gamma\frac{\partial X}{\partial z}$$

$$B = \alpha\frac{\partial Y}{\partial x} + \beta\frac{\partial Y}{\partial y} + \gamma\frac{\partial Y}{\partial z}$$

$$C = \alpha\frac{\partial Z}{\partial x} + \beta\frac{\partial Z}{\partial y} + \gamma\frac{\partial Z}{\partial z}$$

3600
144
72
86400

$\frac{\partial Z}{\partial z} - \frac{\partial Y}{\partial y} +$

$$\frac{\partial Y}{\partial y} - \frac{\partial X}{\partial x} = \eta \qquad \frac{\partial Y}{\partial y} = \eta + \frac{\partial X}{\partial x}$$

$\frac{dy}{dx} = \frac{dy}{ds}\cos\alpha$

$$\frac{\partial Z}{\partial z} = -\frac{\partial X}{\partial x} - \frac{\partial Y}{\partial y}$$

$$\frac{\partial Z}{\partial z} = -\eta - 2\frac{\partial X}{\partial x}$$

~~αA~~

$$B = \alpha\frac{\partial Y}{\partial x} + \beta\eta + \beta\frac{\partial X}{\partial x} + \gamma\frac{\partial Y}{\partial z}$$

$$C = \alpha\frac{\partial Z}{\partial x} + \beta\frac{\partial Z}{\partial y} - \gamma\eta - 2\gamma\frac{\partial X}{\partial x}.$$

$$\underline{\alpha B - \beta A} = \alpha\beta\left(\frac{\partial Y}{\partial y} - \frac{\partial X}{\partial x}\right) + (\alpha^2 - \beta^2)\frac{\partial X}{\partial y} + \alpha\gamma\frac{\partial Y}{\partial z} - \beta\gamma\frac{\partial X}{\partial z}$$

~~$\alpha B - \beta A = \alpha\beta\left(\frac{\partial Y}{\partial y} - \frac{\partial X}{\partial x}\right)$~~

$\alpha B + \beta A =$

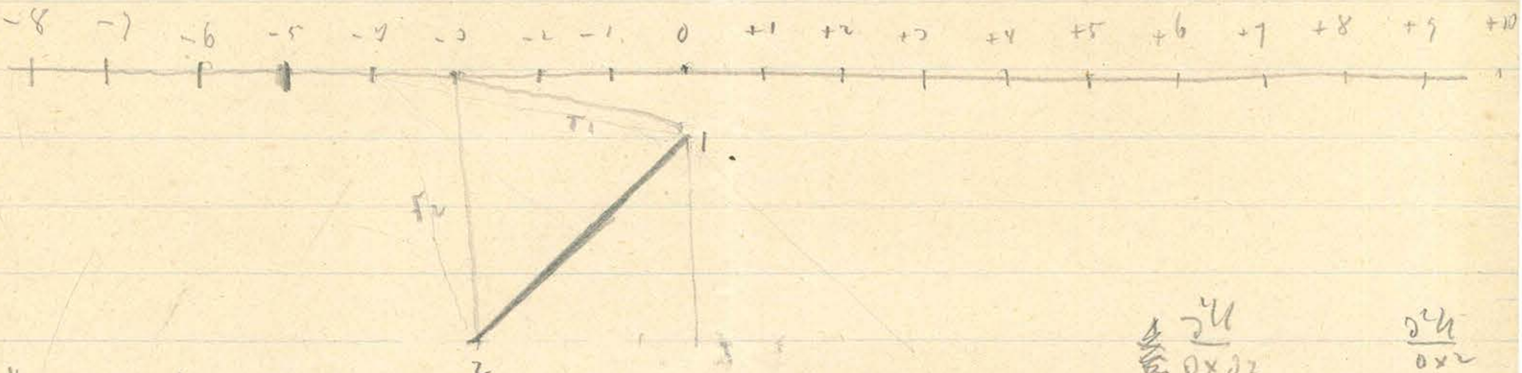
$\alpha = h\cos\vartheta$

$\beta = h\sin\vartheta$

1902

[illegible]

x	r_2^2	r_1^2	log Brigg $\frac{r_2}{r_1}$	log nat. $\frac{r_2}{r_1}$	$\left(\frac{\partial^2 U}{\partial x^2}\right)'$	$\left(\frac{\partial^2 U}{\partial y \partial z}\right)'$
−10	~~116~~ 65	101	−0,0975	−0,2245	−0,5001	−0,1057
−9	~~97~~ 52	82	−0,0989	−0,2278	−0,5456	−0,1234
−8	~~80~~ 41	65	−0,1000	−0,2303	−0,5967	−0,1487
−7	~~65~~ 32	50	−0,0970	−0,2234	−0,6598	−0,1822
−6	~~52~~ 25	37	−0,0852	−0,1962	−0,7347	−0,2285
−5	~~41~~ 20	26	−0,0570	−0,1313	−0,8312	−0,2934
−4	~~32~~ 17	17	0	0	−0,9450	−0,3970
−3	~~25~~ 16	10	+0,1021	+0,2251	−1,0908	−0,5584
−2	17	5	+0,2657	+0,6119	−1,2734 7413	−0,8410
−1	20	2	+0,5000	+1,1513	−1,3868 978	−1,3868
0	25	1	+0,6990	+1,6100	−0,9665	−2,2535
+1	32	2	+0,6021	+1,3868	+0,0978	−2,4004
+2	41	5	+0,4569	+1,0522 2112	+0,7413	−1,9657
+3	52	10	+0,3580	+0,8246 2162	+1,0240	−1,4742
+4	65	17	+0,2913	+0,6710 2240	+1,0978	−1,0798
+5	80	26	+0,2441	+0,5623 2684	+1,0409	−0,7783
+6	97	37	+0,2093	+0,4816 2521	+0,9583	−0,5659
+7	116	50	+0,1828	+0,4210 2388	+0,8669	−0,4201
+8	137	65	+0,1619	+0,3724 2247	+0,7811	−0,3201
+9	160	82	+0,1452	+0,3345 2111	+0,7012	−0,2466
+10	185	101	+0,1315	+0,2029 1972	+0,6445	−0,1955



$\left(\frac{\partial^2 U}{\partial z \partial z}\right)'$	x	$tg\,\varphi_1$	$tg\,\varphi_2$	φ_1	φ_2	$\varphi_1-\varphi_2$		$\frac{\partial^2 U}{\partial x \partial z}$	$\frac{\partial^2 U}{\partial x^2}$
0,1057	-10	0,1000	0,5714	~~45°0'~~ 5°48'	29°44'	24°4'	0,4200	+0,1955	+0,6445
0,1234	-9	0,1111	0,6667	6°20'	33°41'	27°21'	0,4744	+0,2466	+0,7012
0,1481	-8	0,1250	0,8000	7°8'	38°40'	31°32'	0,5504	+0,3201	+0,7811
0,1822	-7	0,1429	1,0000	8°8'	45°0'	36°52'	0,6485	+0,4201	+0,8669
0,2285	-6	0,1667	1,3333	9°28'	53°8'	43°40'	0,7621	+0,5659	+0,9583
0,2934	-5	0,2000	2,000	11°19'	63°26'	52°7'	0,9096	+0,7783	+1,0409
0,3970	-4	0,2500	4,000	14°2'	75°54	61°52'	1,0798	+1,0798	+1,0798
0,5584	-3	0,3333	∞	18°26	90°0	71°34'	1,2491	+1,4742	+1,0240
0,8410	-2	0,5000	4,0000	26°34	75°54'	79°32'	1,3532	+1,9651	+0,7413
1,3868	-1	1,0000	2,0000	45°0	63°26'	71°34'	1,2491	+2,4004	+0,0978
2,2535	0	∞	1,3333	90°	53°8'	36°52'	0,6435	+2,2535	-0,9665
2,4004	+1	1,000	1,0000	45°0	45°0	0°	0,~~[illegible]~~	+1,3868	-1,3868
1,9657	+2	0,5000	0,8000	26°34	38°40'	12°6'	0,2112	+0,8410	-1,2734
1,4742	+3	0,3333	0,6667	18°26	33°41'	15°15'	0,2662	+0,5584	-1,0908
-1,0798	+4	0,2500	0,5714	14°2'	29°44'	15°42'	0,2740	+0,3970	-0,9450
-0,7783	+5	0,2000	0,5000	11°19'	26°43'	15°24'	0,2689	+0,2934	-0,8312
-0,5659	+6	0,1667	0,4444	9°28'	23°58'	14°30'	0,2521	+0,2285	-0,7347
-0,4201	+7	0,1429	0,4000	8°8'	21°49	13°41'	0,2388	+0,1822	-0,6598
-0,3201	+8	0,1250	0,2636	7°8'	19°59'	12°51'	0,2243	+0,1481	-0,5967
-0,2466	+9	0,1111	0,3333	6°20'	18°26'	12°6'	0,2111	+0,1234	-0,5456
-0,1955	+10	0,1000	0,3077	5°48'	17°6'	11°18'	0,1972	+0,1057	-0,5001

x	$\frac{\partial^2 u}{\partial x^2}+\left(\frac{\partial^2 u}{\partial x^2}\right)'$	$\frac{\partial^2 u}{\partial x \partial z}+\left(\frac{\partial^2 u}{\partial x \partial z}\right)'$	$\frac{\partial^2 u}{\partial x^2}+\left(\frac{\partial^2 u}{\partial x^2}\right)'+2\left\{\frac{\partial^2 u}{\partial x \partial z}+\left(\frac{\partial^2 u}{\partial x \partial z}\right)'\right\}$
−10	+0,1444	+0,0898	+0,3240
−9	+0,1556	+0,1232	+0,4020
−8	+0,1844	+0,1720	+0,5284
−7	+0,2071	+0,2379	+0,6829
−6	+0,2236	+0,3334	+0,8904
−5	+0,2097	+0,4849	+1,1795
−4	+0,1348	+0,6828	+1,5004
−3	−0,0668	+0,9158	+1,7648
−2	−0,5321	+1,1241	+1,7161
−1	−1,2890	+1,0136	+0,7382
0	−1,9330	0,0000	−1,9330
+1	−1,2890	−1,0136	−3,3162
+2	−0,5321	−1,1241	−2,7803
+3	−0,0668	−0,9158	−1,8984
+4	+0,1348	−0,6828	−1,2308
+5	+0,2097	−0,4849	−0,7601
+6	+0,2236	−0,3334	−0,4432
+7	+0,2071	−0,2379	−0,2687
+8	+0,1844	−0,1720	−0,1596
+9	+0,1556	−0,1232	−0,0908
+10	+0,1444	−0,0898	

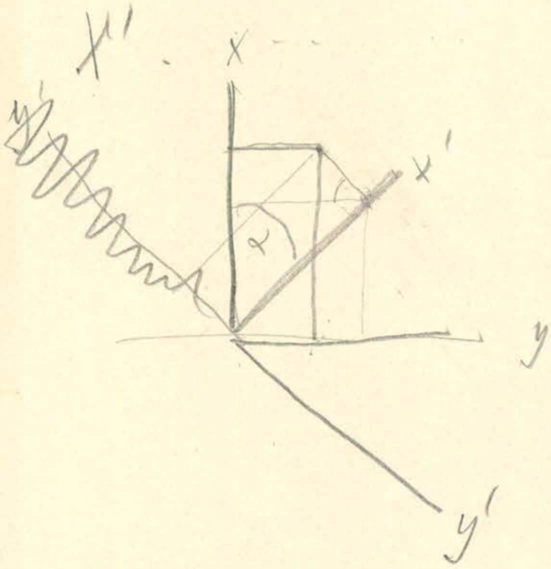
144
1798
2464
1556

2464
1556
908

$X = \frac{x}{r^3} \qquad Y = \frac{y}{r^3} \qquad Z = \frac{z}{r^3}.$

$\frac{\partial X}{\partial x} = -\frac{1}{r^3} + \frac{3x^2}{r^5} \qquad \frac{\partial Y}{\partial y} = -\frac{1}{r^3} + \frac{3y^2}{r^5} \qquad \frac{\partial Z}{\partial z} = -\frac{1}{r^3} + \frac{3z^2}{r^5}$

$\frac{\partial X}{\partial y} = \frac{3xy}{r^5} \qquad \frac{\partial X}{\partial z} = \frac{3xz}{r^5} \qquad \frac{\partial Y}{\partial z} = \frac{3yz}{r^5}$



Angles ; holt

$\measuredangle XOX' = \alpha.$

~~$x = x' \sin\alpha - y' \cos\alpha$~~

~~$x = x' \cos\alpha + y' \sin\alpha$~~

~~$y = x - \sin\alpha -$~~

~~$x = x'$~~

$x = x' \cos\alpha \mp y' \sin\alpha$

$y = x' \sin\alpha + y' \cos\alpha.$

$\frac{\partial X}{\partial x} = -\frac{1}{r^3} + \frac{3}{r^5}\left(x'^2 \cos^2\alpha + y'^2 \sin^2\alpha \mp 2x'y' \sin\alpha \cos\alpha\right)$

$\frac{\partial Y}{\partial y} = -\frac{1}{r^3} + \frac{3}{r^5}\left(x'^2 \sin^2\alpha + y'^2 \cos^2\alpha \pm 2x'y' \sin\alpha\cos\alpha\right.$

$\frac{\partial X}{\partial x} - \frac{\partial Y}{\partial y} = \frac{3}{r^5} x'^2 \cos 2\alpha \mp y'^2 \cos 2\alpha$

$\frac{\partial X}{\partial x} - \frac{\partial Y}{\partial y} = \left(\frac{\partial X'}{\partial x'} - \frac{\partial Y'}{\partial y'}\right) \cos 2\alpha - 2\frac{\partial X'}{\partial y'} \sin 2\alpha.$

$\frac{\partial X}{\partial x} = \frac{\partial X'}{\partial x'} \cos^2\alpha + \frac{\partial Y'}{\partial y'} \sin^2\alpha - \frac{\partial X'}{\partial y'} \sin 2\alpha$

$\frac{\partial Y}{\partial y} = \frac{\partial X'}{\partial x'} \sin^2\alpha + \frac{\partial Y'}{\partial y'} \cos^2\alpha + \frac{\partial X'}{\partial y'} \sin 2\alpha$

$\frac{\partial X}{\partial x} = \frac{\partial X'}{\partial x'} + \frac{3}{r^5}\left(-x'^2 \sin^2\alpha + y'^2 \sin^2\alpha + \right.$

$\frac{\partial X}{\partial x} = \frac{\partial X'}{\partial x'} + \left(\frac{\partial Y'}{\partial y'} - \frac{\partial X'}{\partial x'}\right)\sin^2\alpha - \frac{\partial X'}{\partial y'} \sin 2\alpha$

$\frac{\partial Y}{\partial y} = \frac{\partial Y'}{\partial y'} + \left(\frac{\partial X'}{\partial x'} - \frac{\partial Y'}{\partial y'}\right)\sin^2\alpha + \frac{\partial X'}{\partial y'} \sin 2\alpha$

$\frac{\partial X'}{\partial x}$

$$\frac{\partial X}{\partial x} = -\frac{1}{r^3} + \frac{3}{r^5}\left(x'^2\cos^2\alpha + y'^2\sin^2\alpha - 2x'y'\sin\alpha\cos\alpha\right)$$

$$\frac{\partial Y}{\partial y} = -\frac{1}{r^3} + \frac{3}{r^5}\left(x'^2\sin^2\alpha + y'^2\cos^2\alpha + 2x'y'\sin\alpha\cos\alpha\right)$$

$$\frac{\partial X}{\partial y} = \frac{3x'^2\sin\alpha\cos\alpha}{r^5} - 3\frac{y'^2\sin\alpha\cos\alpha}{r^5} - 3\frac{x'y'\sin^2\alpha}{r^5} + 3\frac{x'y'\cos^2\alpha}{r^5}$$

$$\frac{\partial X}{\partial y} = \left(\frac{\partial X'}{\partial x} - \frac{\partial \cancel{X}'}{\partial y}\right)\frac{\sin 2\alpha}{2} + \frac{\partial X'}{\partial y'}\cos 2\alpha$$

$$\left(\frac{\partial X}{\partial x} - \frac{\partial Y}{\partial y}\right) = \left(\frac{\partial X'}{\partial x} - \frac{\partial Y'}{\partial y}\right)\cos 2\alpha - 2\frac{\partial X'}{\partial y'}\sin 2\alpha$$

$$X = \frac{x-\xi}{r^3} \qquad \frac{\partial X}{\partial x} = -\frac{1}{r^3} + 3\frac{(x-\xi)^2}{r^5}$$

$$\frac{\partial X}{\partial y} = \frac{x-\xi}{r^5}$$

$$\frac{\partial X}{\partial x} = \frac{1}{\varrho}\cos^2\gamma + \frac{1}{\varrho'}\sin^2\gamma$$

$$\frac{\partial X'}{\partial x'} = \frac{1}{\varrho}\cos^2(\gamma+\alpha) + \frac{1}{\varrho}\sin^2(\gamma+\alpha)$$

$$\cos^2(\gamma+\alpha) = \cos^2\alpha\cos^2\gamma + \sin^2\alpha\sin^2\gamma - 2\cos\alpha\cos\gamma\sin\alpha\sin\gamma$$

$$\sin^2(\gamma+\alpha) = \sin^2\gamma\cos^2\alpha + \cos^2\gamma\sin^2\alpha + 2\cos\alpha\cos\gamma\sin\alpha\sin\gamma$$

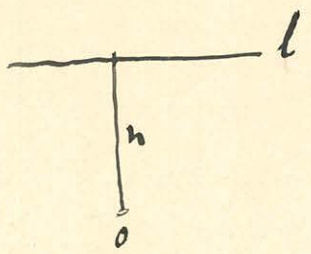
$$\cancel{\cos^2\alpha\cos^2\gamma - \sin^2\alpha\cos^2\gamma\ \sin^2\alpha} -$$

$$\cos^2\gamma$$

$$\cos^2\alpha\cos^2\gamma - \cos^2\gamma\sin^2\alpha + \sin^2\alpha$$

$$= \frac{1}{\varrho}\cos^2\gamma(\cos 2\alpha + \frac{1}{\varrho}\cos^2\gamma\sin^2\alpha$$

$$\sqrt{n^2+(h+il)^2+l^2} = r = \sqrt{(n^2+h^2)+2hil+(1+i^2)l^2}$$



$$\frac{\partial N}{\partial n} = -fkq\int\frac{dl}{r^3} + 3fkqn^2\int\frac{dl}{r^5}$$

$$\frac{\partial L}{dl} = -fkq\int\frac{dl}{r^3} + 3fkq\int\frac{l^2dl}{r^5}$$

$z = h + il$

$$\frac{\partial N}{\partial l} = 3fkqn\int\frac{l\,dl}{r^5}$$

$$\frac{\partial N}{\partial z} = 3fkqn\int\frac{(h+il)dl}{r^5} = 3fkqnh\int\frac{dl}{r^5} + 3fkqni\int\frac{l\,dl}{r^5}$$

$$\frac{\partial L}{\partial z} = 3fkq\int\frac{(h+il)l\,dl}{r^5} = 3fkqh\int\frac{l\,dl}{r^5} + 3fkqi\int\frac{l^2dl}{r^5}$$

$$\int\frac{dl}{r^3} = \Bigg/\frac{(1+i^2)l+hi}{(1+i^2)n^2+h^2}\cdot\frac{1}{r}$$

$$\int\frac{dl}{r^5} = \Bigg/\left(\frac{2}{3}\,\frac{(1+i^2)^2l+hi(1+i^2)}{(n^2(1+i^2)+h^2)^2}\,\frac{1}{r} + \frac{1}{3}\,\frac{(1+i^2)l+4hi}{n^2(1+i^2)+h^2}\cdot\frac{1}{r^3}\right)$$