

-CLOSED FORMULAS - HEIKKINEN

$$1) r = (x^2 + y^2)^{1/2}$$

$$2) F = 54 b^2 z^2$$

$$3) G = r^2 + (1 - e^2) z^2 - e^2 E^2 \quad \text{where } E^2 = a^2 - b^2$$

$$4) \kappa = e^4 F r^2 / G^3$$

$$5) \Delta = [1 + \kappa + (\kappa^2 + 2\kappa)^{1/2}]^{1/3}$$

$$6) P = \frac{F}{3(\Delta + \frac{1}{\Delta} + 1)^2 G^2}$$

$$7) Q = [1 + z e^4 P]^{1/2}$$

$$8) r_0 = \frac{-P e^2 r}{1 + Q} + \left[\frac{a^2}{z} \left(1 + \frac{1}{Q} \right) - \frac{P(1 - e^2) z^2}{Q(1 + Q)} - \frac{P r^3}{z} \right]^{1/2}$$

$$9) U = [(r - e^2 r_0)^2 + z^2]^{1/2}$$

$$10) V = [(r - e^2 r_0)^2 + (1 - e^2) z^2]^{1/2}$$

$$11) z_0 = \frac{b^2 z}{a V}$$

$$12) h = U \left(1 - \frac{b^3}{a V} \right)$$

$$13) \tan \varphi = \frac{z + e^2 z_0}{r}$$

$$14) \tan \lambda = Y/X$$