$$R = \frac{18{,}000}{\pi \cdot D} \qquad (D = d_A)$$

$$\Delta_S = \frac{90 \cdot L_S}{\pi \cdot R} = \frac{D \cdot L_S}{200} \qquad (L_S \text{ in feet}) \qquad \Delta = \left(\frac{\ell_S}{L_S}\right)^2 \cdot \Delta_S \qquad \text{(angles in degrees)}$$

$$\theta_S = \Delta_S \cdot \frac{\pi}{180} = \frac{L_S}{2 \cdot R} \qquad \theta = \left(\frac{\ell_S}{L_S}\right)^2 \cdot \theta_S \qquad \text{(angles in radians)}$$

$$TO = \ell_S \cdot \left[\frac{\theta}{3} - \frac{\theta^3}{42} + \frac{\theta^5}{1{,}320} - \frac{\theta^7}{75{,}600} + \frac{\theta^9}{6{,}894{,}720}\right] \qquad \text{…or…}$$

$$TO = \ell_S \cdot \frac{\theta}{3} \cdot \left[1 - \frac{\theta^2}{2} \cdot \left[\frac{1}{7} - \frac{\theta^2}{20} \cdot \left[\frac{1}{11} - \frac{\theta^2}{126} \cdot \left[\frac{1}{5} - \frac{\theta^2}{456}\right]\right]\right]\right]$$

$$TD = \ell_S \cdot \left[1 - \frac{\theta^2}{10} + \frac{\theta^4}{216} - \frac{\theta^6}{9{,}360} + \frac{\theta^8}{685{,}440}\right] \qquad \text{…or…}$$

$$TD = \ell_S \cdot \left[1 - \frac{\theta^2}{2} \cdot \left[\frac{1}{5} - \frac{\theta^2}{36} \cdot \left[\frac{1}{3} - \frac{\theta^2}{10} \cdot \left[\frac{1}{13} - \frac{\theta^2}{952}\right]\right]\right]\right]$$

$$LT = TD_S - TO_S \cdot \cot(\Delta_S)$$

$$ST = TO_S \cdot \csc(\Delta_S)$$

$$p = TO_S - R \cdot (1 - \cos(\Delta_S))$$

$$q = TD_S - R \cdot \sin(\Delta_S)$$

$$T_S = q + (R + p) \cdot \tan\left(\frac{\Delta_T}{2}\right) \qquad \Delta_T = \Delta_C + 2 \cdot \Delta_S$$

$$LC = \sqrt{TO^2 + TD^2}$$