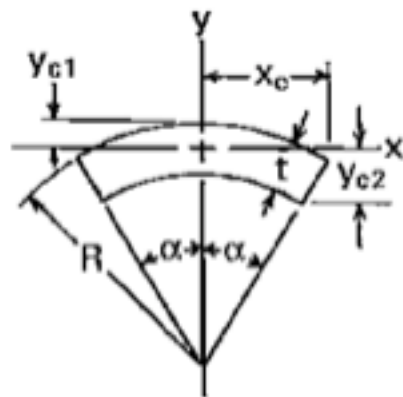


21. Sector of hollow circle



(Note: If t/R is small, α can exceed π to form an overlapped annulus)

$$A = \alpha t(2R - t)$$

$$y_{c1} = R \left[1 - \frac{2 \sin \alpha}{3\alpha} \left(1 - \frac{t}{R} + \frac{1}{2 - t/R} \right) \right]$$

$$y_{c2} = R \left[\frac{2 \sin \alpha}{3\alpha(2 - t/R)} + \left(1 - \frac{t}{R} \right) \frac{2 \sin \alpha - 3\alpha \cos \alpha}{3\alpha} \right]$$

$$x_c = R \sin \alpha$$

$$I_x = R^3 t \left[\left(1 - \frac{3t}{2R} + \frac{t^2}{R^2} - \frac{t^3}{4R^3} \right) \right.$$

$$\times \left(\alpha + \sin \alpha \cos \alpha - \frac{2 \sin^2 \alpha}{\alpha} \right)$$

$$\left. + \frac{t^2 \sin^2 \alpha}{3R^2 \alpha (2 - t/R)} \left(1 - \frac{t}{R} + \frac{t^2}{6R^2} \right) \right]$$

$$I_y = R^3 t \left(1 - \frac{3t}{2R} + \frac{t^2}{R^2} - \frac{t^3}{4R^3} \right) (\alpha - \sin \alpha \cos \alpha)$$

$$r_x = \sqrt{\frac{I_x}{A}}, \quad r_y = \sqrt{\frac{I_y}{A}}$$