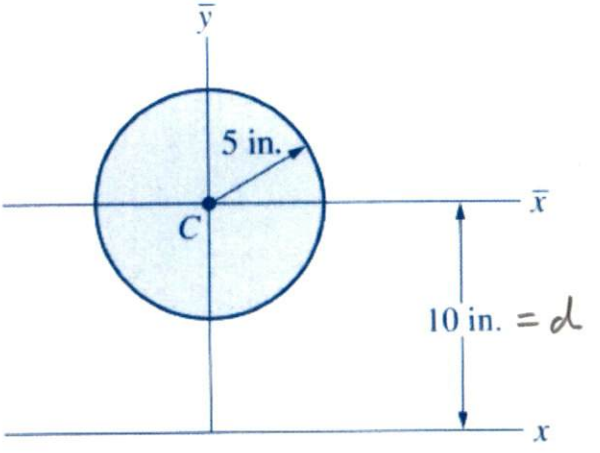
8-3. Refer to Fig. P8-3. Determine the moment of inertia I_x and the radius of gyration r_x of the circular area about the x axis.

Solution.



To determine the moment of Inertia about a noncentroidal axis we need to use the parallel axis theorem

$$I_x = \bar{I}_x + Ad^2 \qquad (8\text{-}7)$$

From Table 8-1

$$\bar{I}_x = \frac{\pi r^4}{4} = \frac{\pi (5\text{in})^4}{4}$$

From 8-7,

$$I_x = \frac{\pi (5\text{in})^4}{4} + \pi (5\text{in})^2 (10\text{in})^2$$

$$= 490.87\ \text{in}^4 + 7853.98\ \text{in}^4$$

$$= 8344.86\ \text{in}^4 \qquad \text{use, } 8340\ \text{in}^4$$

$$r_x = \sqrt{\frac{I_x}{A}} = \sqrt{\frac{8340\ \text{in}^4}{\pi (5\text{in})^2}} = 10.3\ \text{in.}$$