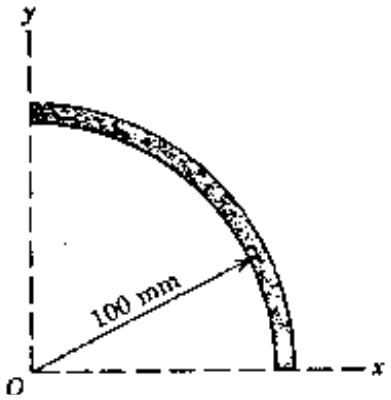
New Problem Sheet No. 6.1

(Area Moment of Inertia of Simple Geometric Figures)

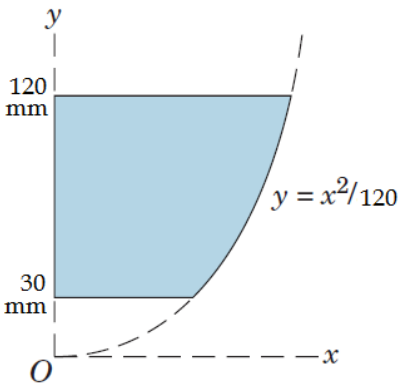
1. The thin quarter-circular ring has an area of 1600 mm^2. Determine the moment of inertia of the ring about the x-axis to a close approximation.

   Ans $I_x = 8(10^6)\ mm^4$



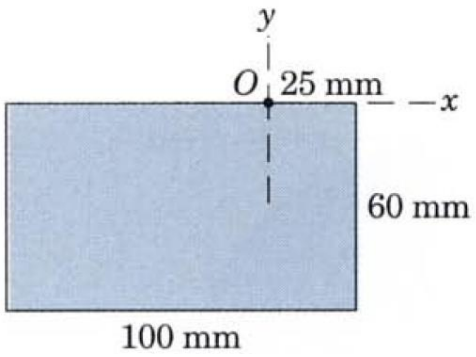
2. Calculate the moment of inertia of the shaded area about the y-axis.

   Ans. $I_y = 26.8(10^6)\ mm^4$



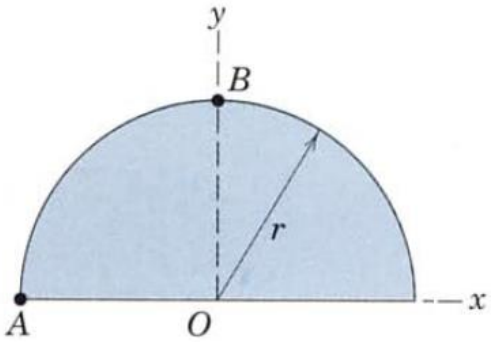
3. Calculate the moment of inertia of the rectangular area about the x-axis and find the polar moment of inertia about point O.

   Ans. $I_x = 7.2(10^6)\ mm^4$, $I_o = 15.95(10^6)\ mm^4$



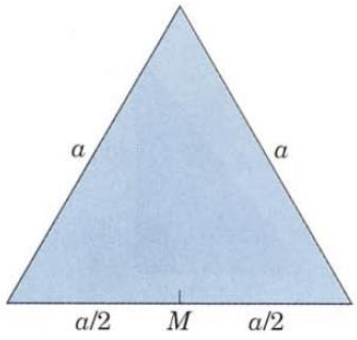
4. Determine the polar moments of inertia of the semicircular area about points A and B.

$$Ans. I_A = \frac{3}{4}\pi r^4, I_B = r^4\left(\frac{3\pi}{4} - \frac{4}{3}\right),$$



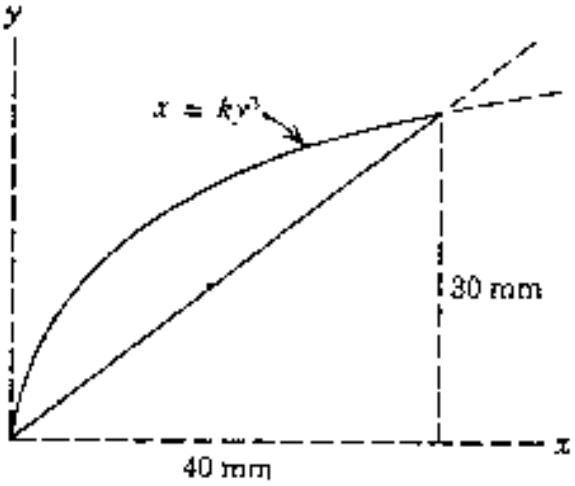
5. Determine the polar radius of gyration of the area of the equilateral triangle about the midpoint M of its base.

$$Ans.\ K_m = \frac{a}{\sqrt{6}}$$



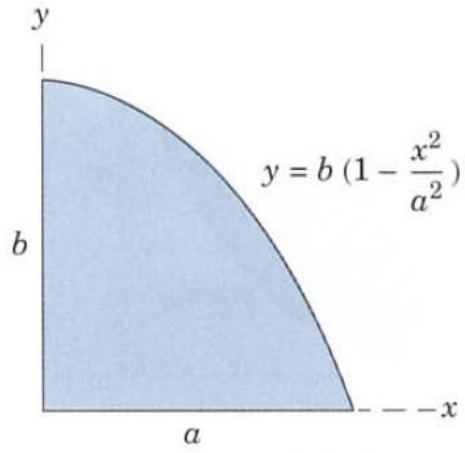
6. Calculate the moment of inertia of the shaded area about the x-axis.

Ans. $I_x = 9(10^4)\ mm^4$



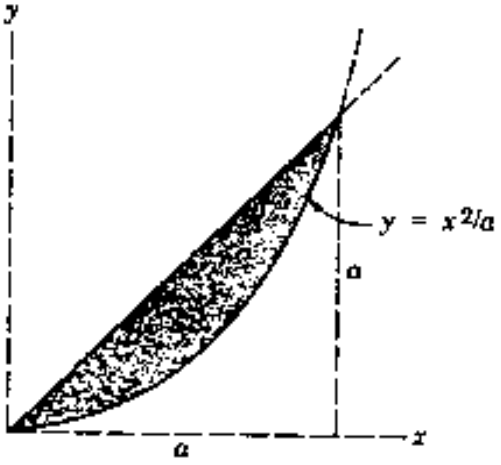
7. Determine the moment of inertia of the shaded area about the x-axis using (a) a horizontal strip of area and (b) a vertical strip of area.

Ans. $I_x = 16ab^3/105$



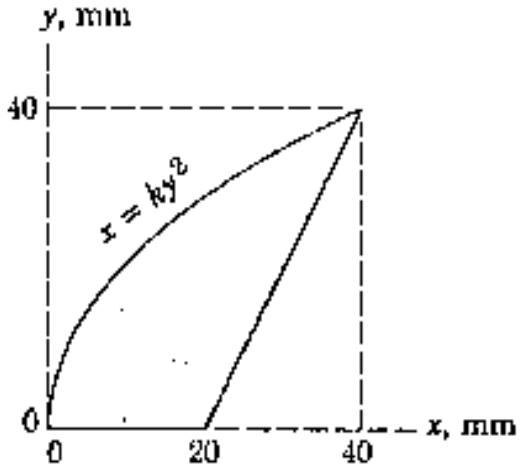
8. Determine the moment of inertia of the shaded area about the x- and y-axes. Use the same differential element for both calculations.

Ans. $I_x = a^4/28$, $I_y = a^4/20$



9. Determine the moment of inertia of the shaded area about the y-axis.

Ans. $I_y = 27.8(10^4)\ mm^4$



10. Calculate the moment of inertia of the overlapping shaded area of the two circles about the x-axis.

Ans. $I_x = 0.1988r^4$