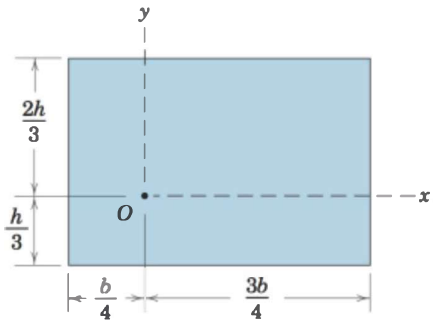
PROBLEMS

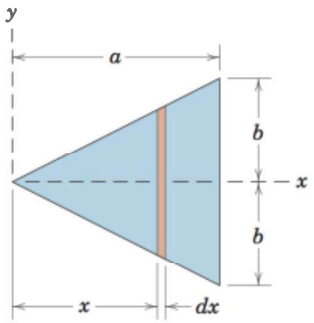
Introductory Problems

A/1 Determine the moments of inertia of the rectangular area about the x- and y-axes and find the polar moment of inertia about point O.



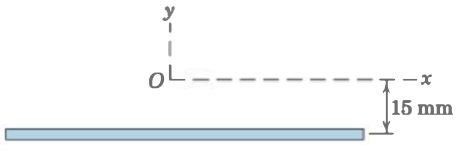
Problem A/1

A/2 Use the differential element shown to determine the moment of inertia of the triangular area about the x-axis and about the y-axis.



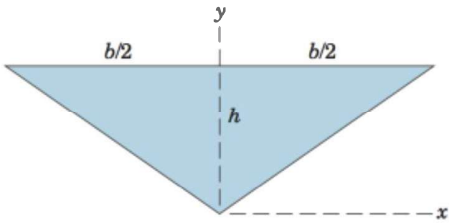
Problem A/2

A/3 The narrow rectangular strip has an area of 300 mm^2, and its moment of inertia about the y-axis is $35(10^3)$ mm^4. Obtain a close approximation to the polar radius of gyration about point O.



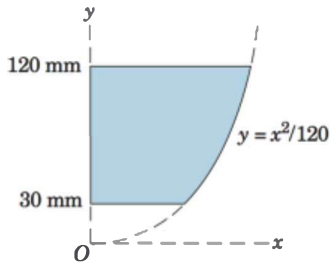
Problem A/3

A/4 Determine the ratio b/h such that $I_x = I_y$ for the area of the isosceles triangle.



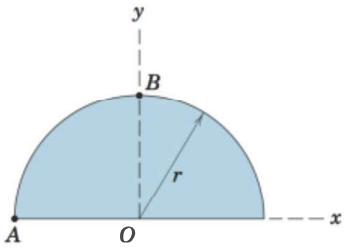
Problem A/4

A/5 Calculate the moment of inertia of the shaded area about the y-axis.



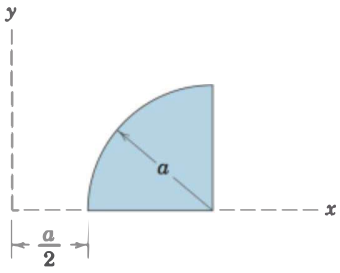
Problem A/5

A/6 Determine the polar moments of inertia of the semicircular area about points A and B.



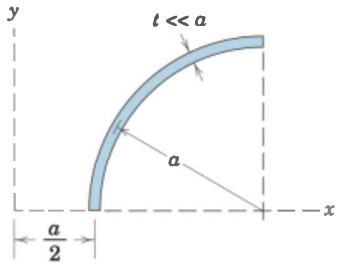
Problem A/6

A/7 Determine the moment of inertia of the quarter-circular area about the y-axis.



Problem A/7

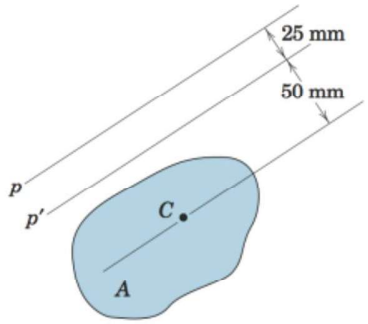
A/8 Determine the moment of inertia of the quarter-circular strip about the y-axis.



Problem A/8

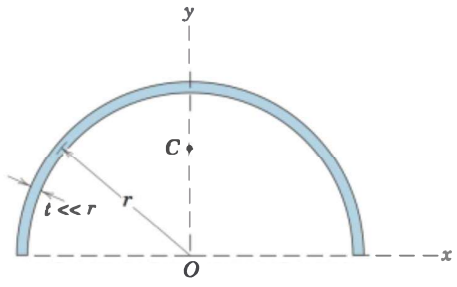
Representative Problems

A/9 The moments of inertia of the area A about the parallel p- and p'-axes differ by $15(10^6)$ mm^4. Compute the area A, which has its centroid at C.



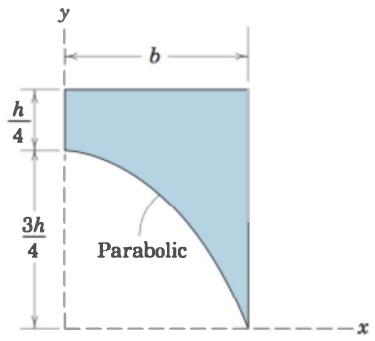
Problem A/9

A/10 Determine the moments of inertia I_x and I_y of the area of the thin semicircular ring about the x- and y-axes. Also find the polar moment of inertia I_C of the ring about its centroid C.



Problem A/10

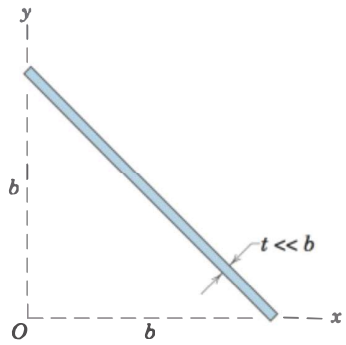
A/11 Determine the moment of inertia of the shaded area about the y-axis.



Problem A/11

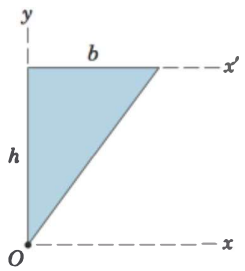
A/12 Determine the moment of inertia of the shaded area of the previous problem about the x-axis.

A/13 Use the relationships developed and used in Sample Problem A/1 to determine expressions for the rectangular and polar moments of inertia I_x, I_y, and I_O of the thin rectangular strip of area A where t is very small compared with b.



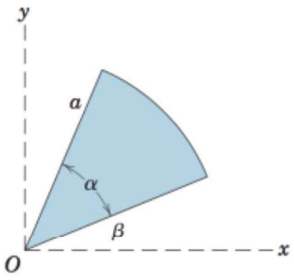
Problem A/13

A/14 By direct integration, determine the moments of inertia of the triangular area about the x- and x'-axes.



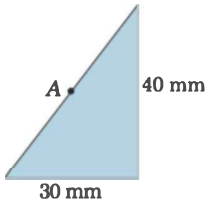
Problem A/14

A/15 Determine the moments of inertia of the shaded circular sector about the x- and y-axes. Set $\beta = 0$ and compare your results with those listed in Table D/3.



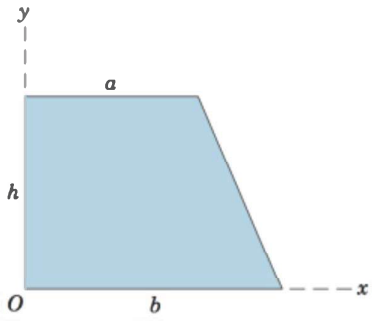
Problem A/15

A/16 Determine the radius of gyration about a polar axis through the midpoint A of the hypotenuse of the right-triangular area. (*Hint:* Simplify your calculation by observing the results for a 30 × 40-mm rectangular area.)



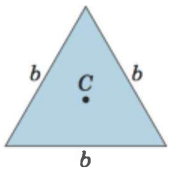
Problem A/16

A/17 Determine by direct integration the moments of inertia of the trapezoidal area about the x- and y-axes. Find the polar moment of inertia about point O.



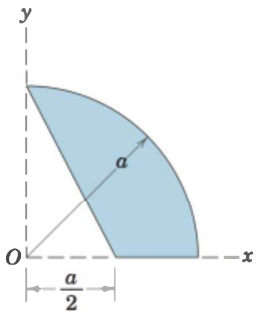
Problem A/17

A/18 Determine the polar radius of gyration of the area of the equilateral triangle of side b about its centroid C.



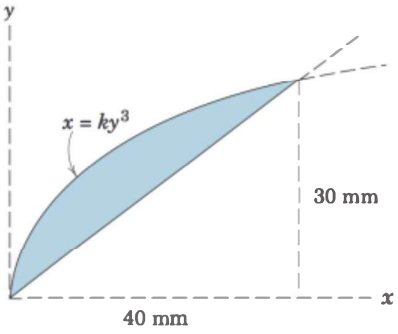
Problem A/18

A/19 Determine the moment of inertia of the shaded area about the x-axis.



Problem A/19

A/20 Calculate the moment of inertia of the shaded area about the x-axis.



Problem A/20