ENSC 2113
Engineering Mechanics: Statics

Lecture 14
Section 9.2

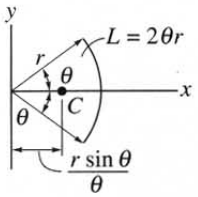
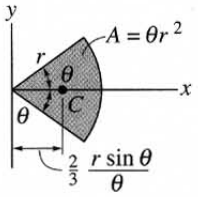
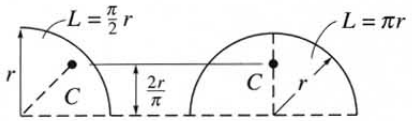
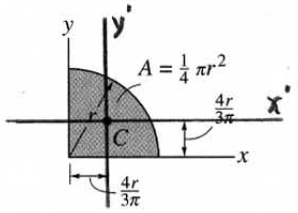
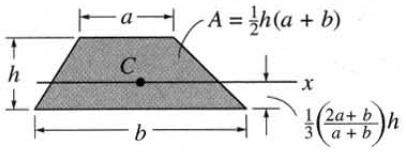
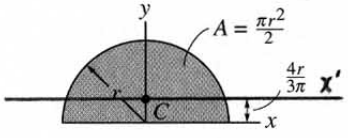
College of Engineering, Architecture & Technology

9.2: Centroids by Composite Bodies

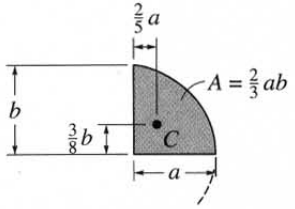
A ***Composite Body*** consists of a series of simple geometric shapes - rectangle, triangle, circle, etc.

Note: The area and centroid are easily found - Refer inside back cover of text or on D2L. (Provided during exam)

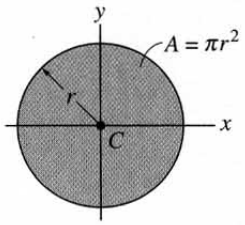
Geometric Properties of Line and Area Elements

Centroid Location	Centroid Location	Area Moment of Inertia
 Circular arc segment	 Circular sector area	$I_x = \frac{1}{4} r^4 (\theta - \frac{1}{2}\sin 2\theta)$ $I_x = \frac{1}{4} r^4 (\theta + \frac{1}{2}\sin 2\theta)$
 Quarter and semicircle arcs	 Quarter circle area	$I_x' = I_y' = .0548 r^4$ $I_x = \frac{1}{16}\pi r^4$ $I_y = \frac{1}{16}\pi r^4$
 Trapezoidal area	 Semicircular area	$I_x' = .1098 r^4$ $I_x = \frac{1}{8}\pi r^4$ $I_y = \frac{1}{8}\pi r^4$

$$\bar{x} = \frac{\sum A\,\tilde{x}}{\sum A} \qquad \bar{y} = \frac{\sum A\,\tilde{y}}{\sum A}$$



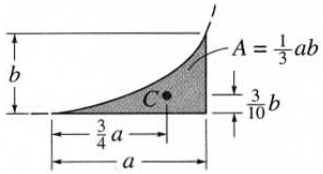
Semiparabolic area



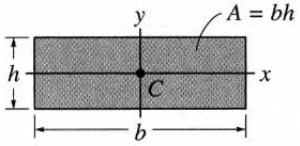
Circular area

$I_x = \frac{1}{4}\pi r^4$

$I_y = \frac{1}{4}\pi r^4$



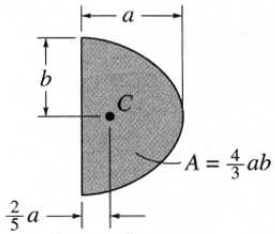
Exparabolic area



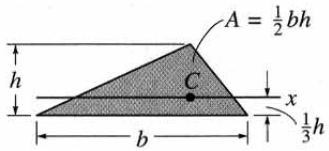
Rectangular area

$I_x = \frac{1}{12}bh^3$

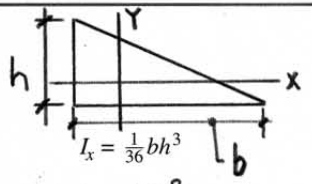
$I_y = \frac{1}{12}hb^3$



Parabolic area



Triangular area



$I_y = \frac{hb^3}{36}$

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