

Unified HANDOUT #M-9

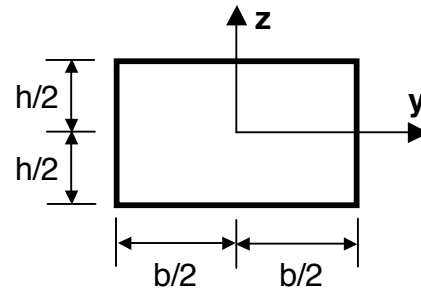
Spring, 2007

Areas and Moments of Inertia* for some Common Cross-Sections

RECTANGLE

$$A = bh$$

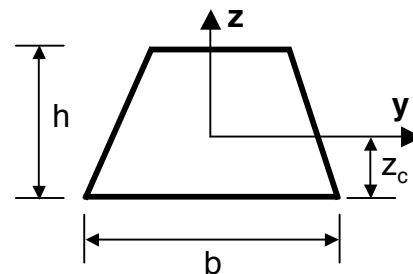
$$I_{yy} = bh^3/12 \quad I_{zz} = hb^3/12 \quad I_{yz} = 0$$



TRAPEZOID

$$A = h(a + b)/2 \quad z_c = h(2a - b)/3(a - b)$$

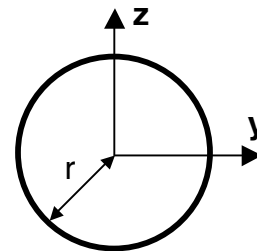
$$I_{yy} = h^3(a^2 + 4ab + b^2)/36(a + b)$$



CIRCLE

$$A = \pi r^2 \quad J = \pi r^4/2$$

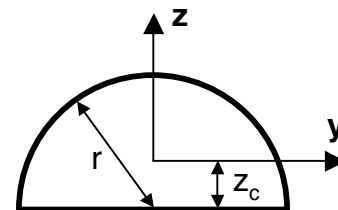
$$I_{yy} = I_{zz} = \pi r^4/4 \quad I_{yz} = 0$$



SEMICIRCLE

$$A = \pi r^2/2 \quad z_c = 4r/3\pi$$

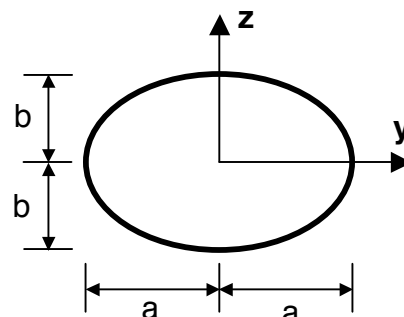
$$I_{yy} = 0.1098r^4 \quad I_{zz} = \pi r^4/8 \quad I_{yz} = 0$$



ELLIPSE

$$A = \pi ab$$

$$I_{yy} = \pi ab^3/4 \quad I_{zz} = \pi ba^3/4 \quad I_{yz} = 0$$



* **NOTE:** All axes are centroidal axes