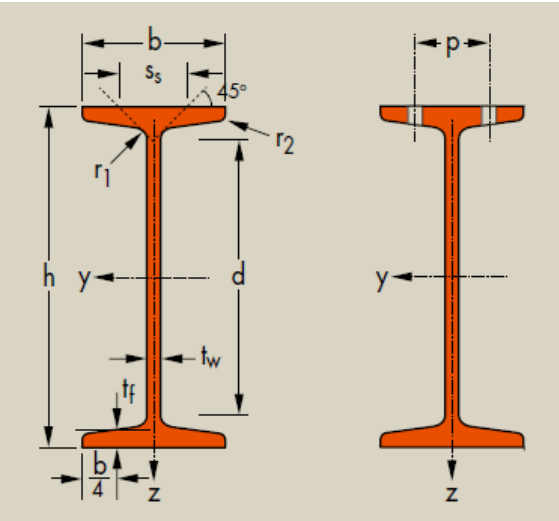
Momentos de inercia



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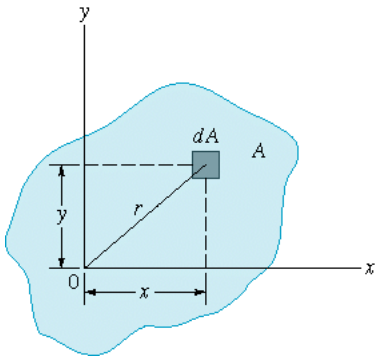
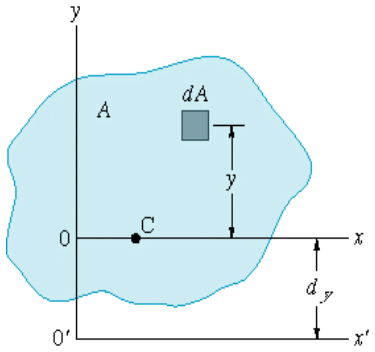
Momentos de inercia de area

$$I_x = \int_A y^2 dA$$

$$I_y = \int_A x^2 dA$$



Momentos de inercia respecto de un eje paralelo



$$I_{y'} = I_y + A \cdot d_x^{\,2}$$

Módulo resistente (módulo de sección)

$$W = \frac{I}{c}$$

Momento de inercia polar

$$J = I_x + I_y$$

Primer momento cortante

$$\mathrm{I_y} = \int_{\mathrm{A}} \mathrm{x}\,\mathrm{dA}$$

Radio de giro

$$r_g = \sqrt{\frac{I}{A}}$$

Basado en "Elementos de máquinas" HAMROCK, BERNARD J. et al.

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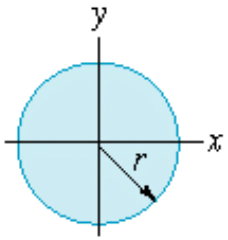
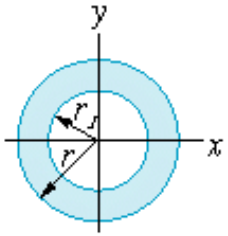
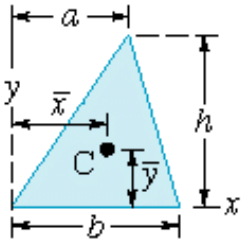
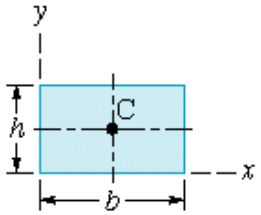
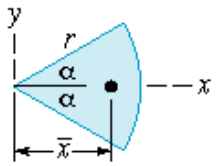
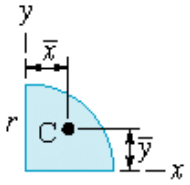
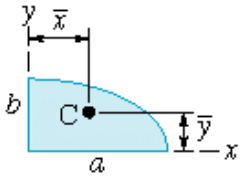
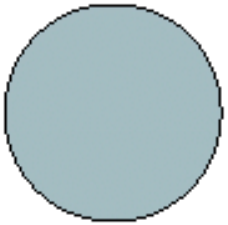
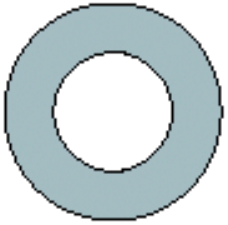
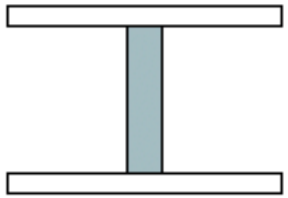
Momentos de inercia de Área

Cross section	Centroid	Area moment of inertia	Area
Circular area 	$\bar{x} = 0$ $\bar{y} = 0$	$I_x = I_{\bar{x}} = \frac{\pi}{4} r^4$ $I_y = I_{\bar{y}} = \frac{\pi}{4} r^4$ $J = \frac{\pi}{2} r^4$	$A = \pi r^2$
Hollow circular area 	$\bar{x} = 0$ $\bar{y} = 0$	$I_x = I_{\bar{x}} = \frac{\pi}{4}\left(r^4 - r_i^4\right)$ $I_y = I_{\bar{y}} = \frac{\pi}{4}\left(r^4 - r_i^4\right)$ $J = \frac{\pi}{2}\left(r^4 - r_i^4\right)$	$A = \pi\left(r^2 - r_i^2\right)$
Triangular area 	$\bar{x} = \frac{a+b}{3}$ $\bar{y} = \frac{h}{3}$	$I_x = \frac{bh^3}{12}$, $I_{\bar{x}} = \frac{bh^3}{36}$ $I_y = \frac{bh\left(b^2 + ab + a^2\right)}{12}$ $I_{\bar{y}} = \frac{bh\left(b^2 - ab + a^2\right)}{36}$ $\bar{J} = \frac{bh}{36}\left(b^2 + h^2\right)$	$A = \frac{bh}{2}$

Cross section	Centroid	Area moment of inertia	Area
Rectangular area 	$\bar{x} = \frac{b}{2}$ $\bar{y} = \frac{h}{2}$	$I_x = \frac{bh^3}{3}$, $I_{\bar{x}} = \frac{bh^3}{12}$ $I_y = \frac{hb^3}{3}$, $I_{\bar{y}} = \frac{hb^3}{12}$ $\bar{J} = \frac{bh}{12}(b^2 + h^2)$	$A = bh$
Area of circular sector 	$\bar{x} = \frac{2}{3}\frac{r \sin \alpha}{\alpha}$	$I_x = \frac{r^4}{4}(\alpha - \frac{1}{2}\sin 2\alpha)$ $I_y = \frac{r^4}{4}(\alpha + \frac{1}{2}\sin 2\alpha)$ $J = \frac{1}{2}r^4\alpha$	$A = r^2\alpha$
Quarter-circular area 	$\bar{x} = \bar{y} = \frac{4r}{3\pi}$	$I_x = I_y = \frac{\pi r^4}{16}$ $I_{\bar{x}} = I_{\bar{y}} = \left(\frac{\pi}{16} - \frac{4}{9\pi}\right)r^4$ $J = \frac{\pi r^4}{8}$	$A = \frac{\pi r^2}{4}$
Area of elliptical quadrant 	$\bar{x} = \frac{4a}{3\pi}$ $\bar{y} = \frac{4b}{3\pi}$	$I_x = \frac{\pi ab^3}{16}$, $I_{\bar{x}} = \left(\frac{\pi}{16} - \frac{4}{9\pi}\right)ab^3$ $I_y = \frac{\pi a^3 b}{16}$, $I_{\bar{y}} = \left(\frac{\pi}{16} - \frac{4}{9\pi}\right)a^3 b$ $J = \frac{\pi ab}{16}(a^2 + b^2)$	$A = \frac{\pi ab}{4}$

Esfuerzos cortantes
de geometrías habituales

Cross section	Maximum shear stress
 Rectangular	$\tau_{máx} = \frac{3V}{2A}$
 Circular	$\tau_{máx} = \frac{4V}{3A}$
 Round tube	$\tau_{máx} = \frac{2V}{A}$
 I-beam	$\tau_{máx} = \frac{V}{A_{web}}$