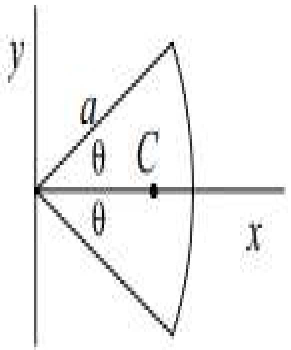
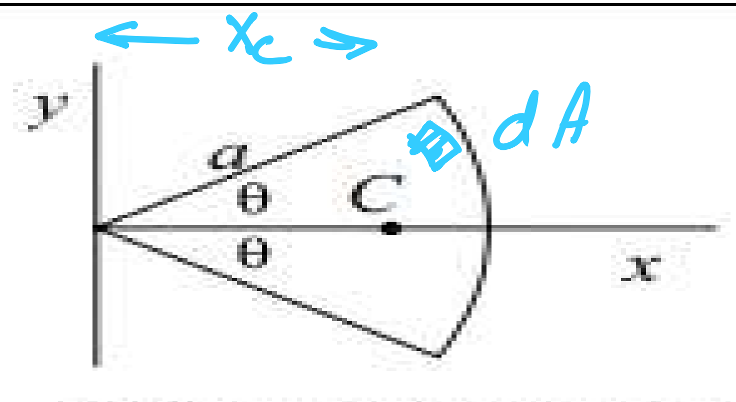
Circular Sector

Figure	Area & Centroid	Area Moment of Inertia	(Radius of Gyration)^2	Product of Inertia
 CIRCULAR SECTOR	$A = a^2\theta$ $x_c = \frac{2a}{3}\frac{\sin\theta}{\theta}$ $y_c = 0$	$I_x = a^4(\theta - \sin\theta\cos\theta)/4$ $I_y = a^4(\theta + \sin\theta\cos\theta)/4$	$r_x^2 = \frac{a^2}{4}\frac{(\theta - \sin\theta\cos\theta)}{\theta}$ $r_y^2 = \frac{a^2}{4}\frac{(\theta + \sin\theta\cos\theta)}{\theta}$	$I_{x_c y_c} = 0$ $I_{xy} = 0$

Prepared by Eng.Maged Kamel.

Area and Cg for circular sector.

a : is the radius.

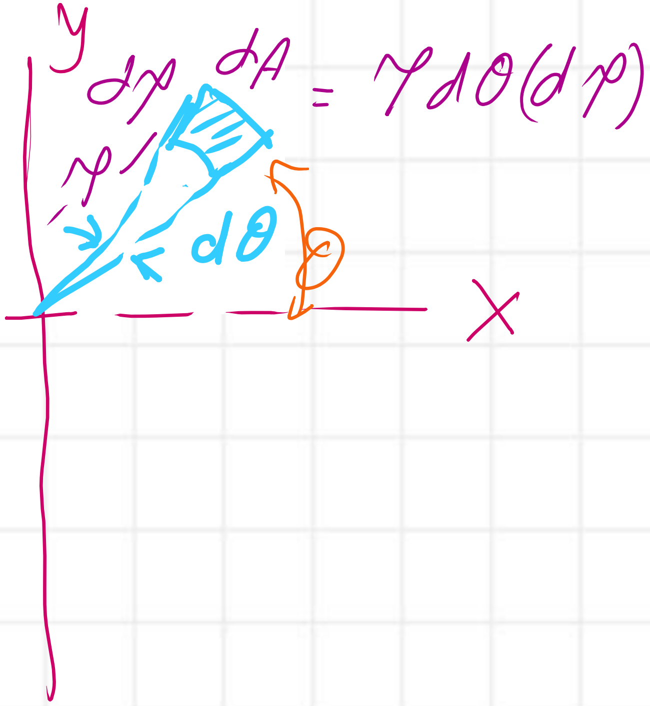


CIRCULAR SECTOR

$$A = a^2\theta$$

$$x_c = \frac{2a}{3}\frac{\sin\theta}{\theta}$$

$$y_c = 0$$

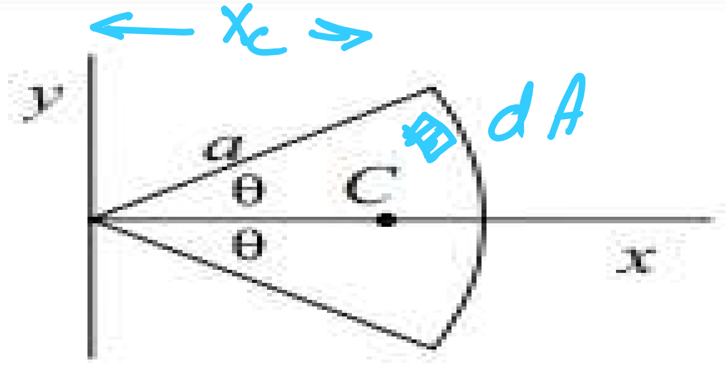


$$dA = r\,d\theta\,dr$$

$$\int dA = \int_{-\theta}^{\theta}\int_{0}^{a} r\,dr\,(d\theta) = \left(\frac{r^2}{2}\Big|_0^a\right)\left(\theta\Big|_{-\theta}^{\theta}\right)$$

$$A = \left(\frac{a^2}{2} - 0\right)\left(\left(\theta - (-\theta)\right)\right) = \frac{a^2}{2}(2\theta) = a^2\theta.$$

Area and Cg for circular sector.

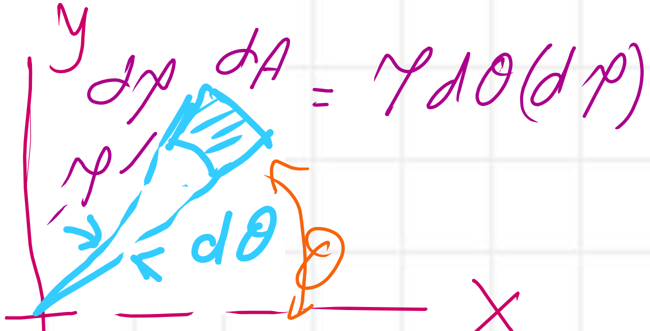


CIRCULAR SECTOR

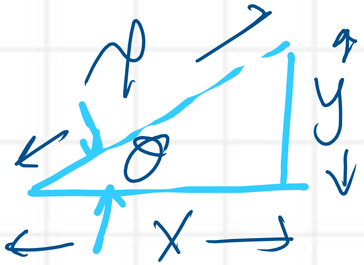
$$A = a^2\theta$$

$$x_c = \frac{2a}{3}\,\frac{\sin\theta}{\theta}$$

$$y_c = 0$$



$$dA = r\,d\theta\,(dr)$$



$$\int dA\cdot x = (r\,d\theta\,dr)(r\cos\theta)$$

$$\int dA\cdot(x) = \int_{-\theta}^{\theta}\int_{0}^{a} r^2\,dr\,(\cos\theta)(d\theta)$$

$$A\cdot x_c = \left[\frac{r^3}{3}\Big|_0^a\right]\left[\sin\theta\right]_{-\theta}^{\theta} = \frac{a^3}{3}\left(\sin\theta - (\sin(-\theta))\right) = \frac{a^3}{3}(+2\sin\theta)$$

$$x_c = \frac{2}{3}\,\frac{a^3\sin\theta}{a^2\theta} = \frac{2}{3}\,\frac{a\sin\theta}{\theta}$$

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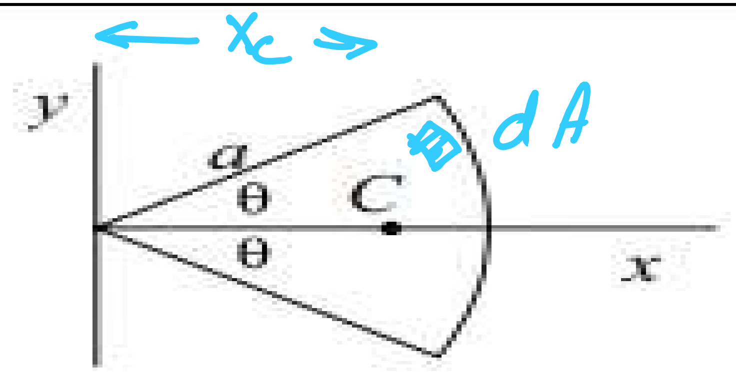
Area and Cg for circular sector.



CIRCULAR SECTOR

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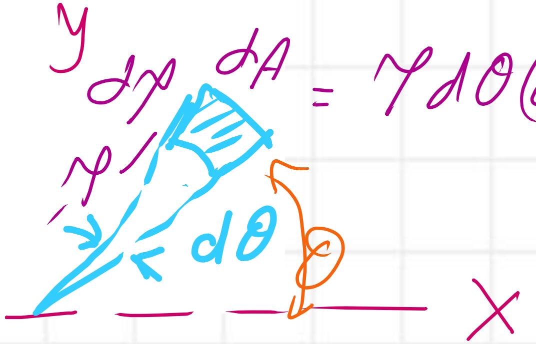
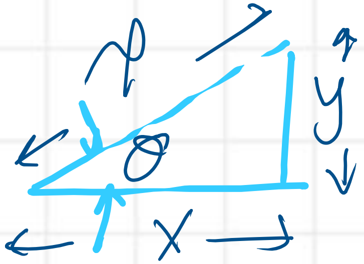


$$dA = r\,d\theta\,(dr)$$

$$\int dA \cdot y = (r\,d\theta\,dr)(r\sin(\theta))$$

$$= \int_{-\theta}^{\theta}\int_{0}^{a} r^2\,dr\,(\sin(\theta))(d\theta)$$



$$A \cdot y_c = \left[\frac{r^3}{3}\Big|_0^a\right]\left[-\right]\left[\cos\theta\Big|_{-\theta}^{\theta}\right] = \frac{a^3}{3}(-)(\cos\theta - (+\cos\theta)) = 0$$

$$y_c = 0$$

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