Problemas sobre centroides

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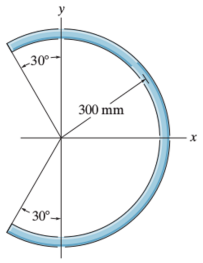
Localice el centro de masa de la barra homogénea doblada en la forma de un arco circular.



solución:

$x = \frac{\int_a^b x dL}{\int_a^b dL}$ $x =$

$R\cos\theta$

$y = \frac{\int_a^b y dL}{\int_a^b dL}$ $y =$

$R\sin\theta$

$dL = Rd\theta$

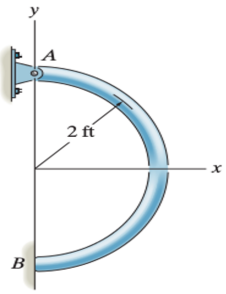
$$x = \frac{\int_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}} R^2\cos\theta d\theta}{\int_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}} Rd\theta} = \frac{R\int_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}} \cos\theta d\theta}{\int_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}} d\theta}$$

$$y = \frac{\int_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}} R^2\sin\theta d\theta}{\int_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}} Rd\theta} = \frac{R\int_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}} \sin d\theta}{\int_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}} d\theta}$$

$$x = \frac{R[\sin\theta]_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}}}{[\theta]_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}}} = \frac{R\sqrt{3}}{\left[\frac{2\pi}{3}+\frac{2\pi}{3}\right]} = \frac{3\sqrt{3}R}{4\pi} = 0.124m$$

$$y = \frac{R[-\cos\theta]_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}}}{[\theta]_{-\frac{2\pi}{3}}^{\frac{2\pi}{3}}} = \frac{R[0.5+(-0.5)]}{\frac{4\pi}{3}} = 0$$

Localice el centro de gravedad de la barra homogénea doblada en forma de un arco semicircular. La varilla tiene un peso por unidad de longitud de 0.5 lb/ft. También determine la reacción horizontal en el soporte liso B y las componentes X e Y de reacción en el pasador A .



solución:

$x = 2\cos\theta$

$y = 2\sin\theta$

$dL = 2d\theta$

$$x = \frac{\int_a^b x dL}{\int_a^b dL} = \frac{\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} 2\cos\theta 2 d\theta}{\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} 2 d\theta}$$

$$= \frac{4[\sin\theta]_{-\frac{\pi}{2}}^{\frac{\pi}{2}}}{[2\theta]_{-\frac{\pi}{2}}^{\frac{\pi}{2}}}$$

$$= \frac{4}{\pi} \text{ ft}$$

$Arc\ length = \pi r = 2\pi$

$W = 2\pi\,(0.5)\,lb$

$\Sigma M_A = 0; \qquad -2\pi\,(0.5)\left(\frac{4}{\pi}\right) + B_A\,(4) = 0$

$$B_1 = 1lb$$

$\Sigma F_x = 0; \qquad A_x = 1lb$

$\Sigma F_y = 0; \qquad A_y = 3.14lb$