Problemas sobre centroides

Julio Arturo Figueroa-Amador[1]

[1]Instituto Tecnológico Superior Zacatecas Occidente

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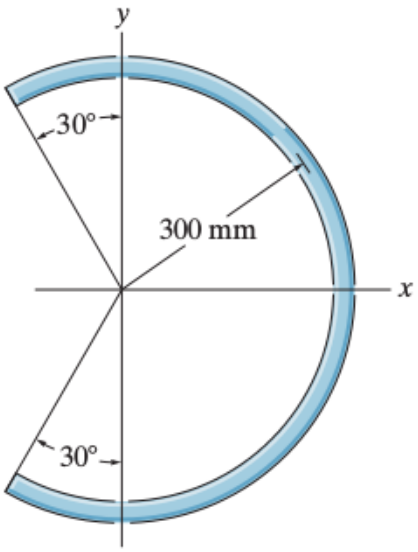
Ejercicio #1

9–1. Locate the center of mass of the homogeneous rod bent into the shape of a circular arc.



Prob. 9–1

Figure 1: Ejercicio 1

Solución:

$x = \frac{\int_1 dL}{\int_1 dL}$

$y = \frac{\int_1 y\ dL}{\int_1 dL}$

$x = R\cos\theta$

$y = R\sin\theta$

$dL = Rd\theta$

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

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

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

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

El Resultado es 0.124 m

Ejercicio #2

Solución

$\left[\frac{\Pi}{2}, \ -\frac{\Pi}{2}\right]$

$x = rCos\theta y = r \ Sin \ \theta$

$dL = rd\theta$

$w = \left(0.5 \ \frac{lb}{ft}\right) \ \Pi \ ft$

Σfy

$Ay = w$

$$x = \frac{\int_1 r \ \cos\theta \ rd\theta}{\int_1 rd\theta} = \frac{r^2\int_{-\frac{\Pi}{2}}^{\frac{\Pi}{2}} \cos\theta \ d\theta}{r \ \int_{-\frac{\Pi}{2}}^{\frac{\Pi}{2}} d\theta} = \frac{2r}{\Pi}$$

$B_x - A_x \ = 0$

$A_y - w = 0$

$A_y = \Pi lb$

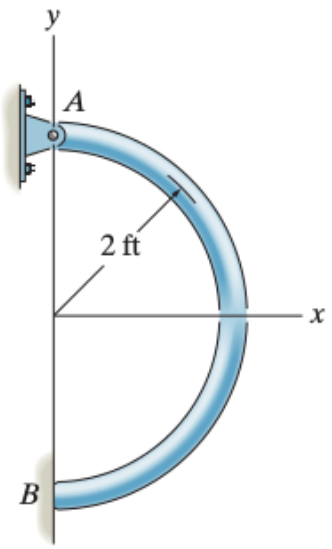
$-x \ w + 4B_x \ = 0$

$-\left(\frac{2r}{\Pi}\right)(\Pi lb) + 4B_x = 0$

$(4ft) \ B_x = \left(\frac{2r}{\Pi}\right)(\Pi lb)$

$B_x = 1lb$

9–2. Locate the center of gravity $\bar{x}$ of the homogeneous rod bent in the form of a semicircular arc. The rod has a weight per unit length of 0.5 lb/ft. Also, determine the horizontal reaction at the smooth support B and the x and y components of reaction at the pin A.



Prob. 9–2

Figure 2: Problema 3

$\frac{w}{L} = 0.5\ \frac{lb}{ft}$

$L = \Pi\,(2\ ft)$

$= \Pi lb$

$B_x = A_x = 1lb$

Resultado = 1 lb