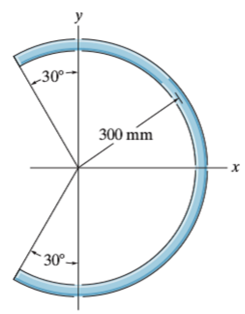
Problemas sobre centroides

Leonel Orona-Flores
Instituto Tecnológico Superior Zacatecas Occidente

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



Prob. 9–1

Figure 1. This is a caption

Y=0

$x\frac{\int_1 x \quad dl}{\int_1 \quad x \quad dl}$

x=r cos θ

Y=r sen θ

dl= $\sqrt{dx^2+dy^2}$ =r^2 $\left(sen^2\ \theta\ d\theta^2\right)+r^2\left(\cos^2\ d\theta^2\right)$

dx=- r sen θ =$\sqrt{r^2 d\theta^2\left(sen^2\theta+\cos^2\theta\right)}$

dy= r cos θ dθ =rθ

$$=\frac{\int_{\frac{-2\Pi}{3}}^{\frac{2\Pi}{3}} r \quad \cos\theta \ d\theta}{\int_{\frac{-2\Pi}{3}}^{\frac{2\Pi}{3}} r \ d\theta}=\frac{r^2 \quad \int_{\frac{-2\Pi}{3}}^{\frac{2\Pi}{3}} \cos\theta \ d\theta}{r\int_{\frac{-2\Pi}{3}}^{\frac{-2\Pi}{3}} \ d\theta}$$

$$=\frac{r \ sen \ \theta\Big|_{\frac{-2\Pi}{3}}^{\frac{2\Pi}{3}}}{\theta\Big|_{\frac{-2\Pi}{3}}^{\frac{2\Pi}{3}}}=\frac{r|0.0866+0.866|}{\frac{4\Pi}{3}}=\frac{300mm|1.732|}{4.189}=$$

$124\ mm$

$$X=\frac{\int_2 x \ dl}{\int_2 \ dl}=\int_{\frac{-\Pi}{2}}^{\frac{\Pi}{2}} r \quad \cos\theta \ r\theta$$

X= r cos θ

dl= r d θ

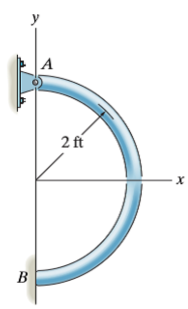
$$\frac{r \ sen \ \theta\Big|_{\frac{-\Pi}{2}}^{\frac{\Pi}{2}}}{\theta\Big|_{\frac{-\Pi}{2}}^{\frac{\Pi}{2}}}=\frac{r[1+1]}{\Pi}=\frac{2(2)}{\Pi}=\frac{4}{2}=1.25$$

(1) .$\Sigma \quad fx$ Bx=11b

2.- $\Sigma \quad fy$ Ax= 11b

3.- $\Sigma \quad ma$ Ay= Π lb

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. This is a caption

1.- Ax +Bx

2.- Ay -w= 0

Ay= w

3.- -xw +Bx (4ft)= 0

-2 r/Π(0.5 lb/ft)Π + Bx (4ft) =0

-2r^2(0.5 lb/ ft) + 4 ft Bx= 0

4ft Bx= 2 r^2 (0.5 lb/ft)

Bx= 2r^2/4 ft (0.5 lb/ ft) =[2(4ft) / (4ft)] (0.5 lb) = 1 lb