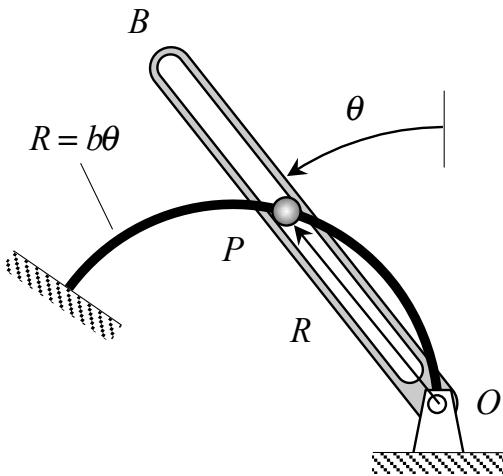


**Homework H1.E**

**Given:** Particle P is constrained to move along a fixed, curved guide whose shape is governed by the following equation in polar variables:  $R = b\theta$ , where  $R$  is in inches and  $\theta$  is in radians. P is also constrained to move within a straight slot cut into arm OB, with OB pinned to ground at O, and whose orientation is at the angle of  $\theta$  measured counterclockwise from the vertical. Arm OB is known to be rotating in the counterclockwise sense with a constant rate of  $\dot{\theta} = \omega$ .

**Find:** For position of  $\theta = 30^\circ$ :

- show the position of P and the polar unit vectors  $\hat{e}_R$  and  $\hat{e}_\theta$  in a sketch.
- determine the velocity and acceleration of P. Express your answers as vectors in terms of the polar unit vectors. Show these two vectors in your sketch.



Use the following parameters in your work:  $b = 4$  in and  $\omega = 16$  rad/s.