Problem 1H1.H

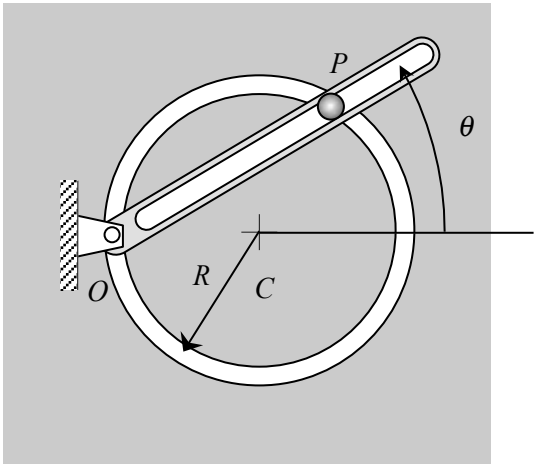
Given: Particle P is constrained to move within a circular slot with a radius of R and center at point C. P is also constrained to move within the straight slot cut in an arm, with the arm rotating about end O with a constant rate of $\dot{\theta} = \omega$. O is located within the circular slot immediately to the left of C.

Find: For the position of $\theta = 45°$:

(a) show the path unit vectors $\hat{e}_t$ and $\hat{e}_n$, along with polar unit vectors $\hat{e}_r$ and $\hat{e}_\theta$, in a sketch. Note that the polar variable r is measured from point O to P, thus defining the direction for $\hat{e}_r$.

(b) determine numerical values for the rate of change of speed $\dot{v}_P$ of P and for $\dot{r}$, $\ddot{r}$ and $\ddot{\theta}$.

(c) is the speed of P increasing or decreasing? Explain.



Use the following parameters in your analysis: $R = 8$ in and $\omega = 4$ rad/s.

