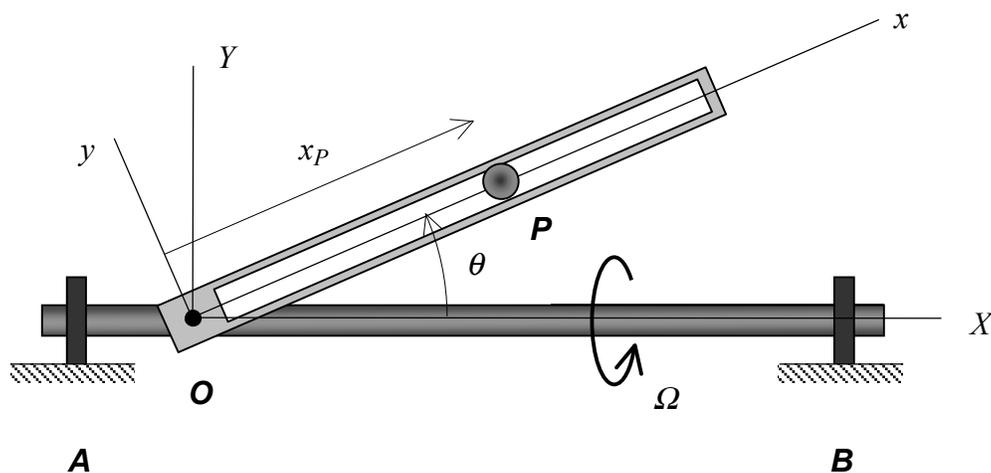


Homework H3.1

Given: Shaft AB rotates about a fixed axis with a constant rotational speed of Ω . A tube is hinged on shaft AB with the angle θ between the tube and shaft increasing at a constant rate of $\dot{\theta}$. Particle P moves within the tube at a constant rate of \dot{x}_P relative to the tube. The XYZ coordinate system is fixed with the X -axis aligned with the fixed rotation axis of the shaft AB. The xyz coordinate system is attached to the tube with the x -axis aligned with the tube for all time. For the position shown below, the z - and Z -axes are aligned.

Find: For the position shown, determine the acceleration of particle P. Write your answer as a vector in terms of its xyz components.



Use the following parameters in your analysis: $\Omega = 3 \text{ rad/s}$, $\theta = 60^\circ$, $\dot{\theta} = -4 \text{ rad/s}$, $x_P = 2 \text{ m}$ and $\dot{x}_P = -2 \text{ m/s}$.