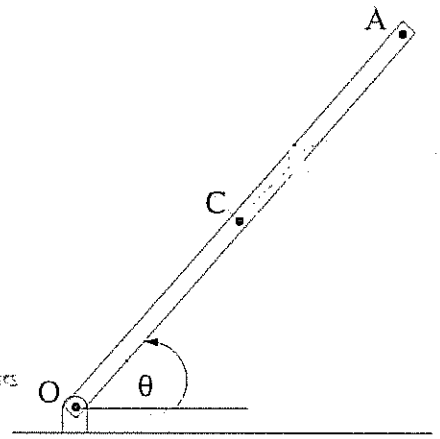
Quiz No.1

Tuesday, February 3, 2009

A mechanical arm OA has a length of 6 meters. At time $t = 0$, a cat is located at point C which is the midpoint of OA, and is walking towards O at a constant speed of 0.7 m/s. At the time $t = 0$, $\dot{\theta}$ is equal to -0.5 rad/s, and $\ddot{\theta}$ is equal to a constant value of 0.33 rad/s^2.



a) At time $t = 0$, find the acceleration of the cat in polar $r\theta$-coordinates.

b) At time $t = 0$, find the magnitude of the velocity of A with respect to the cat. At time $t=3$, find the acceleration of the cat in polar $r\theta$-coordinates

c) At time $t = 3$ seconds, what will be the **tangential** component of the acceleration of A?

Useful equations: $\vec{\mathbf{a}} = (\ddot{r} - r\dot{\theta}^2)\ \hat{\mathbf{u}}_\mathbf{r} + (r\ddot{\theta} + 2\dot{r}\dot{\theta})\ \hat{\mathbf{u}}_\theta$;

$$\vec{\mathbf{a}} = \dot{v}\ \hat{\mathbf{u}}_\mathbf{t} + v^2/\rho\ \hat{\mathbf{u}}_\mathbf{n}$$