Name

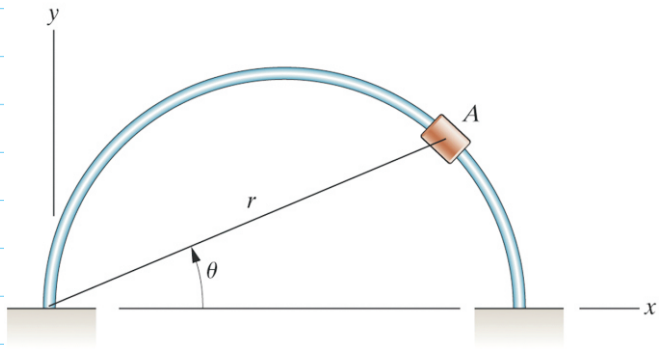
Date

## Week: _____ Problem: _____

## Given:

The collar $A$ slides on the circular bar. The radial position of $A$ (in meters) is given as a function of $\theta$ by $r = 2\cos\theta$. At the instant shown, $\theta = 25^\circ$ and $d\theta/dt = 4$ rad/s. Determine the velocity of $A$ in terms of polar coordinates.

Determine the acceleration of $A$ in terms of polar coordinates.




## Required:

## Solution:

**Solution:**

$r = 2\cos\theta,\ \dot{r} = -2\sin\theta\dot{\theta},\ \ddot{r} = -2\sin\theta\ddot{\theta} - 2\cos\theta\dot{\theta}^2$

Using the given data we have

$\theta = 25^\circ,\ \dot{\theta} = 4,\ \ddot{\theta} = 0$

$r = 1.813,\ \dot{r} = -3.381,\ \ddot{r} = -29.00$

$$\mathbf{v} = \dot{r}\mathbf{e}_r + r\dot{\theta}\mathbf{e}_\theta = (-3.381\mathbf{e}_r + 7.25\mathbf{e}_\theta)\ \text{m/s}$$

$$\mathbf{a} = (\ddot{r} - r\dot{\theta}^2)\mathbf{e}_r + (r\ddot{\theta} + 2\dot{r}\dot{\theta})\mathbf{e}_\theta = (-58.0\mathbf{e}_r - 27.0\mathbf{e}_\theta)\ \text{m/s}^2$$