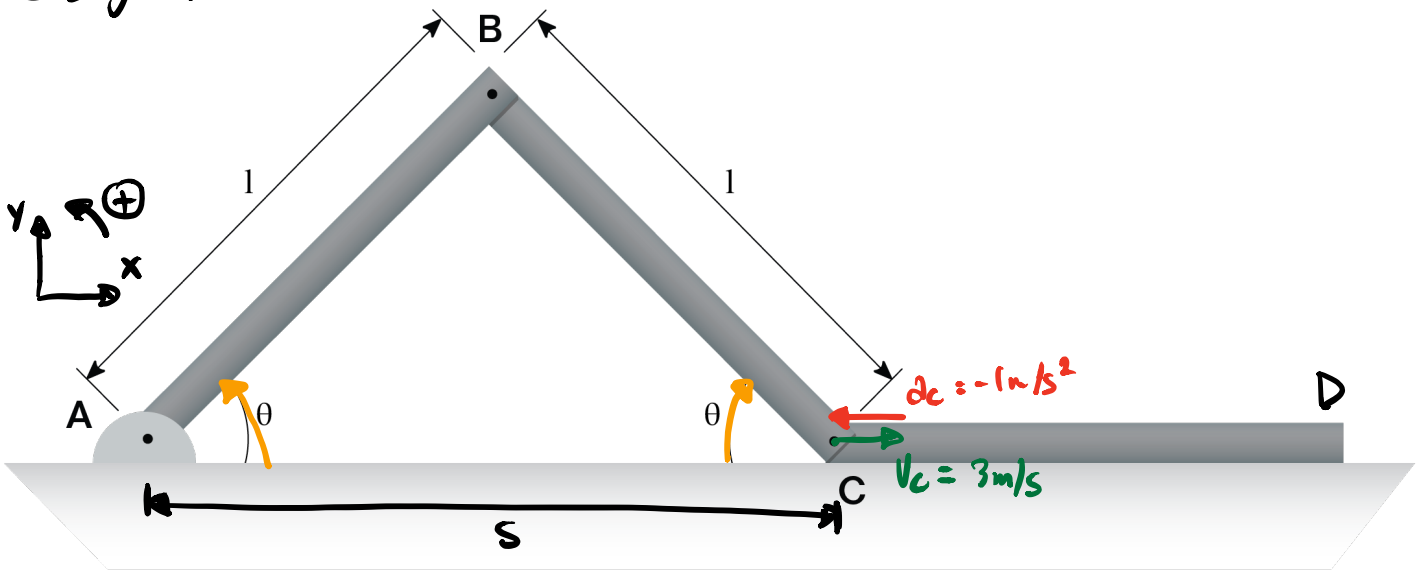
Determine the angular velocities and angular accelerations of links AB and BC if end D has a velocity of $v = 3m/s$ to the right and an acceleration of $a = 1m/s^2$ to the left. Link AB and BC both have a length $l = 0.5m$ and the angle is given as $\theta = 60deg$.

① Diagram



$\vec{V} = \vec{\omega} \times \vec{r}$

$s = (0.5)\cos\theta\, 2 = \cos\theta$

$\dot{s} = -\sin\theta \cdot \dot{\theta} = -\sin\theta\, \omega \quad \Rightarrow \quad 3 = -\sin(60°)\,\omega$

$\therefore \omega = -2\sqrt{3}\ rad/s$

$$\vec{\omega}_{AB} = -2\sqrt{3}\ rad/s\ \hat{k} \qquad \vec{\omega}_{BC} = 2\sqrt{3}\ rad/s\ \hat{k}$$

$\ddot{s} = -\cos\theta\,\dot{\theta}^2 - \sin\theta(\ddot{\theta})$

$-1 = -\cos(60°)(2\sqrt{3})^2 - \sin(60°)\,\alpha$

$\therefore \alpha = \frac{-10\sqrt{3}}{3}\ rad/s^2$

$$\vec{\alpha}_{AB} = \frac{10\sqrt{3}}{3}\ rad/s^2\ \hat{k} \qquad \vec{\alpha}_{BC} = -\frac{10\sqrt{3}}{3}\ rad/s^2\ \hat{k}$$