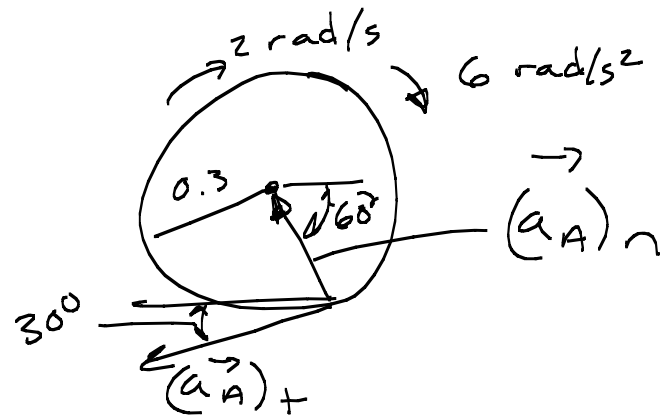
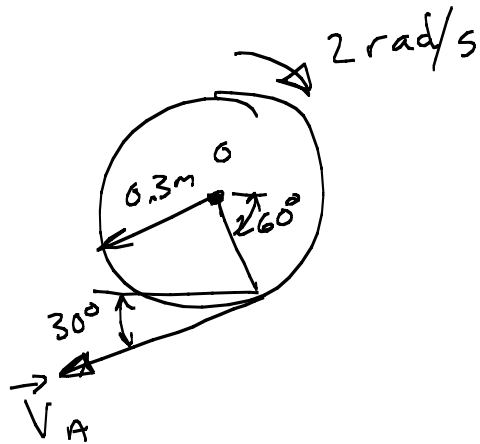
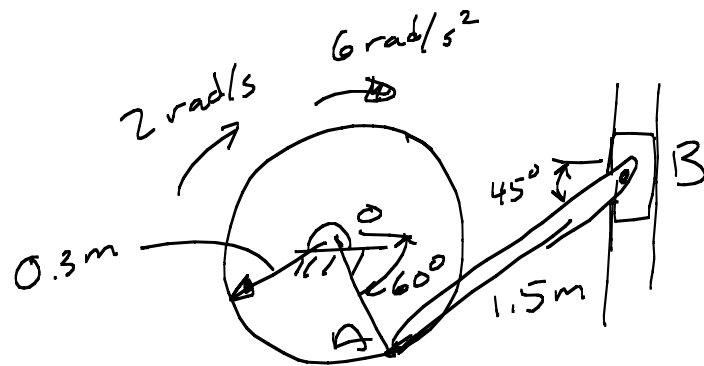


# Problem 1

Determine: Acceleration at B



$$V_A = \omega r_{A/O} = (2 \text{ rad/s})(0.3 \text{ m}) = 0.6 \text{ m/s}$$

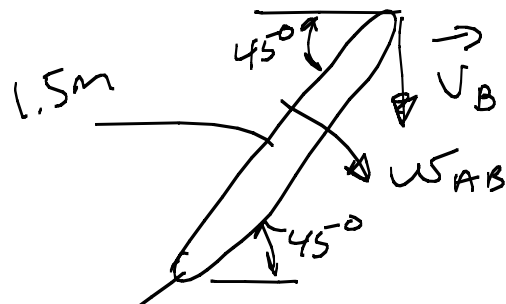
$$\vec{V}_A = \{-0.6 \cos 30^\circ \hat{i} - 0.6 \sin 30^\circ \hat{j}\}$$

$$(a_A)_n = \omega^2 r_{A/O} = (2 \text{ rad/s})^2 (0.3 \text{ m}) = 1.2 \text{ m/s}^2$$

$$(a_A)_t = \alpha r_{A/O} = (6 \text{ rad/s}^2)(0.3 \text{ m}) = 1.8 \text{ m/s}^2$$

$$\vec{a}_A = \{ -1.2 \cos 60^\circ \hat{i} + 1.2 \sin 60^\circ \hat{j} \} + \{ -1.8 \cos 30^\circ \hat{i} - 1.8 \sin 30^\circ \hat{j} \}$$

$$\vec{a}_A = \{ -2.16 \hat{i} + 0.139 \hat{j} \} \text{ m/s}^2$$



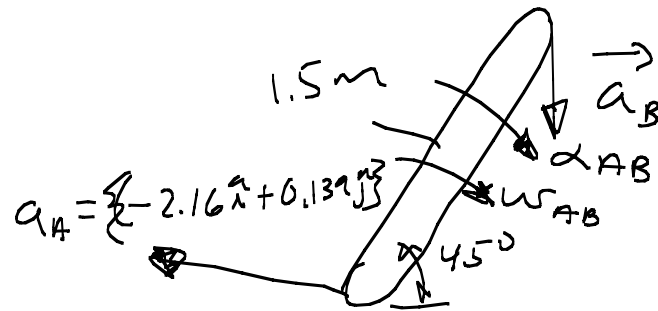
$$\vec{v}_A = \{ -0.6 \cos 30^\circ \hat{i} - 0.6 \sin 30^\circ \hat{j} \}$$

$$\vec{v}_B = \vec{v}_A + \vec{v}_{B/A}$$

$$-v_B \hat{j} = \{ -0.6 \cos 30^\circ \hat{i} - 0.6 \sin 30^\circ \hat{j} \} +$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & -\omega_{AB} \\ 1.5 \cos 45^\circ & 1.5 \sin 45^\circ & 0 \end{vmatrix}$$

$$-v_B \hat{j} = \{ -0.6 \cos 30^\circ \hat{i} - 0.6 \sin 30^\circ \hat{j} \} + \{ \omega_{AB} (1.5 \sin 45^\circ) \hat{i} - \omega_{AB} (1.5 \cos 45^\circ) \hat{j} \}$$



$$\vec{v}_{B/A} = \vec{\omega}_{AB} \times \vec{r}_{B/A}$$

$$\vec{r}_{B/A} = \{ 1.5 \cos 45^\circ \hat{i} + 1.5 \sin 45^\circ \hat{j} \}$$

i-comp

$$0 = -0.6 \cos 30^\circ + \omega_{AB} (1.5 \sin 45^\circ)$$

$$\omega_{AB} = 0.4899 \text{ rad/s}$$

$$\vec{a}_B = \vec{a}_A + \alpha_{AB} \times \vec{r}_{B/A} - \omega_{AB}^2 \vec{r}_{B/A}$$

$$-a_B \hat{j} = \{-2.16 \hat{i} + 0.139 \hat{j}\} + \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 0 & -\alpha_{AB} \\ 1.5 \cos 45^\circ & 1.5 \sin 45^\circ & 0 \end{vmatrix} - (0.4899)^2 (1.5 \cos 45^\circ \hat{i} + 1.5 \sin 45^\circ \hat{j})$$

$$-a_B \hat{j} = \{-2.16 \hat{i} + 0.139 \hat{j}\} + \{ \alpha_{AB} (1.5 \sin 45^\circ) \hat{i} - \alpha_{AB} (1.5 \cos 45^\circ) \hat{j} \} - \{ (0.4899)^2 (1.5 \cos 45^\circ) \hat{i} + (0.4899)^2 (1.5 \sin 45^\circ) \hat{j} \}$$

i-comp

$$0 = -2.16 + \alpha_{AB} (1.5 \sin 45^\circ) - (0.4899)^2 (1.5 \cos 45^\circ)$$

$$\alpha_{AB} = 2.28 \text{ rad/s}^2$$

j-comp

$$-a_B = 0.139 - (2.28)(1.5 \cos 45^\circ) - (0.4899)^2 (1.5 \sin 45^\circ)$$

$$a_B = 2.53 \text{ m/s}^2$$