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1. A disk (r = 0.5 ft) rotates with an initial angular velocity of 2 rad/s and a constant angular acceleration of 1 rad/s$^2$ . Determine the magnitudes of the velocity and acceleration of a point on the rim of the disk when t = 2s. ans v = 2 ft/s, |a| = 8.02ft/s$^2$

$$\omega = \omega_0 + \alpha_c\, t;$$

$$\omega = 2 + 1(2) = 4 \text{ rad/s}$$

$$v = r\omega; \qquad v = 0.5(4) = 2 \text{ ft/s}$$

$$a_t = r\alpha\,; \qquad a_t = 0.5(1) = 0.5 \text{ ft/s}^2$$

$$a_n = \omega^2 r; \qquad a_n = (4)^2(0.5) = 8 \text{ ft/s}^2$$

$$a = \sqrt{8^2 + (0.5)^2} = 8.02 \text{ ft/s}^2$$

2. A wheel rotates with $\omega = 4\theta^{0.5}$. Determine how low it will take to achieve an angular velocity of $\omega = 150\frac{rad}{s}$ when t = 0 and $\theta$ = 0 ans = 18.75 s

$$\omega = 4\theta^{1/2}$$

$$150 \text{ rad/s} = 4\,\theta^{1/2}$$

$$\theta = 1406.25 \text{ rad}$$

$$dt = \frac{d\theta}{\omega}$$

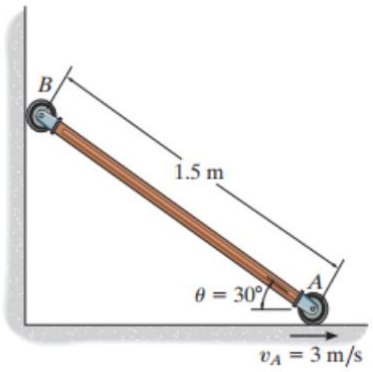
$$\int_0^t dt = \int_0^\theta \frac{d\theta}{4\theta^{1/2}}$$

$$t\Big|_0^t = \tfrac{1}{2}\,\theta^{1/2}\Big|_0^\theta$$

$$t = \tfrac{1}{2}\,\theta^{1/2}$$

$$t = \tfrac{1}{2}\,(1406.25)^{1/2} = 18.75 \text{ s}$$

3. If a roller at A moves to the right at 3 m/s, determine the angular velocity of the link and the velocity of roller B when the angle is 30 degrees. $\omega = 4\frac{rad}{s}, V_B = 5.2\ m/s$




$$\mathbf{v}_B = \mathbf{v}_A + \boldsymbol{\omega} \times r_{B/A}$$

$$-v_B\mathbf{j} = (3\mathbf{i})\text{m/s} + (\omega\mathbf{k}) \times (-1.5\cos 30°\mathbf{i} + 1.5\sin 30°\mathbf{j})$$

$$-v_B\mathbf{j} = [3 - \omega_{AB}(1.5\sin 30°)]\mathbf{i} - \omega(1.5\cos 30°)\mathbf{j}$$

$$0 = 3 - \omega(1.5\sin 30°) \quad (1)$$

$$-v_B = 0 - \omega(1.5\cos 30°) \quad (2)$$

$$\omega = 4\ \text{rad/s} \qquad v_B = 5.20\ \text{m/s} \qquad \textit{Ans.}$$