

9. a) $t = ?$ b) $\Delta\theta = ?$

$$\omega_0 = 12.60 \text{ rad/s}$$

$$\alpha = -4.20 \text{ rad/s}^2$$

$$\omega_f = 0$$

$$\omega_f = \omega_0 + \alpha t \quad t = \frac{\omega_f - \omega_0}{\alpha} = \frac{0 - 12.6}{-4.2}$$

$$t = 3 \text{ s}$$

$$\Delta\theta = \frac{1}{2}(\omega_0 + \omega_f)t$$

$$= \frac{1}{2}(12.6 + 0)3$$

$$\Delta\theta = 18.9 \text{ rad}$$

10. $\alpha = ?$ $\omega_{avg} = ?$ $\omega(5.0) = ?$

$$\omega_0 = 0 \quad \Delta\theta = 25 \text{ rad} \quad t = 5 \text{ s}$$

$$\Delta\theta = \omega_0 t + \frac{1}{2} \alpha t^2$$

$$25 = 0(5) + \frac{1}{2} \alpha (5)^2$$

$$\frac{50}{25} = \alpha \quad \alpha = 2 \text{ rad/s}^2$$

$$\omega_{avg} = \frac{\Delta\theta}{\Delta t} = \frac{25 \text{ rad}}{5 \text{ s}} = 5 \text{ rad/s}$$

$$\omega(5) = \omega_f = \omega_0 + \alpha t$$
$$= 0 + (2)(5)$$

$$\omega_f = 10 \text{ rad/s}$$

d) $\Delta\theta = ?$ (5 to 10 sec)

$$\Delta\theta = \omega_0 t + \frac{1}{2} \alpha t^2$$

$$= (10)(5) + \frac{1}{2} (2) (5)^2$$

$$\Delta\theta = 75 \text{ rad}$$

16. a) $t = ?$ $\omega_0 = 0$ $\alpha = 1.5 \text{ rad/s}^2$
 $\Delta\theta = 4\pi \text{ rad}$

$$\Delta\theta = \omega_0 t + \frac{1}{2} \alpha t^2$$

$$4\pi = 0(t) + \frac{1}{2}(1.5)t^2$$

$$16.76 = t^2$$

$$\boxed{4.09 \text{ s} = t}$$

$$\begin{aligned}\omega_f &= \omega_0 + \alpha t \\ &= 0 + (1.5)(4.09) \\ &= 6.14 \text{ rad/s}\end{aligned}$$

b) $t = ?$ $\Delta\theta = 4\pi \text{ rad}$ $\omega_0 = 6.14 \text{ rad/s}$
 $\alpha = 1.5 \text{ rad/s}^2$

$$4\pi = 6.14t + \frac{1}{2}(1.5)t^2$$

oh, snap, I've gotta use quadratic!

or...

$$\Delta\theta = 8\pi$$

$$\omega_0 = 0$$

$$\alpha = 1.5 \text{ rad/s}^2$$

$$8\pi = 0t + \frac{1}{2}(1.5)t^2$$

$$t = 5.788$$

for (b) $t = 5.788 - 4.09 \text{ s}$

$$= 1.699$$

$$\boxed{t = 1.7 \text{ s}}$$