

Phys 2110-4 3/16/12

Note Title

3/16/2012

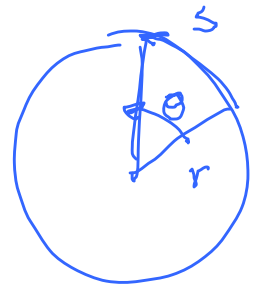
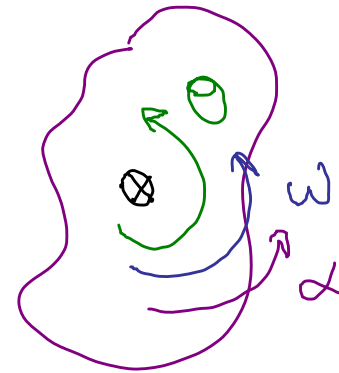
Rotations

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

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

θ radians

constant α

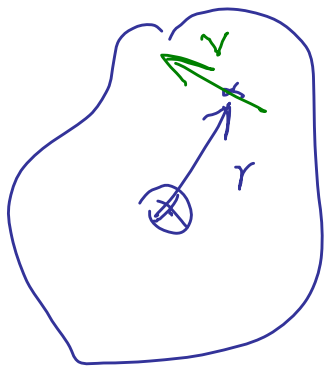


$$s = r\theta$$

$$\omega = \omega_0 + \alpha t$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2} \alpha t^2$$

$$\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$$



$$V = r\omega$$

$$a_t = r\alpha$$

$$a_c = r\omega^2$$

10.15 Express each in radians per second.

a) 720 rpm b) $50^\circ/\text{h}$ c) $1000 \frac{\text{rev}}{\text{s}}$

a)

$$720 \frac{\text{rev}}{\text{min}} \cdot \left(\frac{2\pi \text{ rad}}{1 \text{ rev}} \right) \left(\frac{1 \text{ min}}{60 \text{ s}} \right) = 75.4 \text{ s}^{-1}$$

$$b) \quad \frac{50^\circ}{h} \cdot \left(\frac{\pi \text{ rad}}{180 \text{ deg}} \right) \left(\frac{1 h}{3600 s} \right) = 2.41 \times 10^{-4} \frac{\text{rad}}{s}$$

$$c) \quad \left(1000 \frac{\text{rev}}{s} \right) \left(\frac{2\pi \text{ rad}}{1 \text{ rev}} \right) = 6.28 \times 10^3 \frac{\text{rad}}{s}$$

10.18 During startup power plant's turbine accel from rest at $0.52 \frac{\text{rad}}{\text{s}^2} (\alpha)$.

a) How long does it take to reach its 3600 rpm op. speed?


b) How many rev's does it make during this time?



$$\omega = (3600 \text{ rev/min}) \left(\frac{2\pi \text{ rad}}{1 \text{ rev}} \right) \left(\frac{1 \text{ min}}{60 \text{ s}} \right)$$

$$= 377 \frac{\text{rad}}{\text{s}}$$

a) $\omega = \omega_0 + \alpha t$



$$t = 12 \text{ min(?)}$$