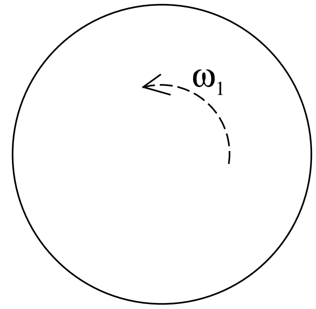
Problem 10.7

A grinder is rotating at $\omega_1 = 1.00\text{x}10^2$ rpm and angularly acceleration at $\alpha = -2.00\ \text{rad/sec}^2$.



a.) How long does it take the grinder to stop?

Noting that we have to convert "rev/min" to "rad/sec," the equation of the hour is:

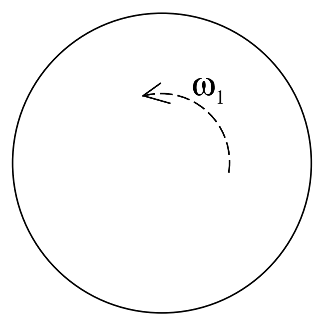
$$\overset{0}{\cancel{\omega_2}} = \omega_1 + \alpha(\Delta t)$$

$$\Rightarrow \quad \Delta t = \frac{-\omega_1}{\alpha}$$

$$= \frac{-\left(1.00\text{x}10^2\ \frac{\cancel{\text{rev}}}{\cancel{\text{min}}}\right)\left(\frac{2\pi}{1}\ \frac{\text{rad}}{\cancel{\text{rev}}}\right)\left(\frac{1}{60}\ \frac{\cancel{\text{min}}}{\text{sec}}\right)}{\left(-2.00\ \text{rad/sec}^2\right)}$$

$$= 5.24\ \text{sec}$$

b.) Through how many radians will the wheel turn during the time interval?



Noting that:

$$\omega_1 = \left(1.00\text{x}10^2\ \frac{\cancel{\text{rev}}}{\cancel{\text{min}}}\right)\left(\frac{2\pi}{1}\ \frac{\text{rad}}{\cancel{\text{rev}}}\right)\left(\frac{1}{60}\ \frac{\cancel{\text{min}}}{\text{sec}}\right)$$

$$= 10.5\ \text{rad/sec}$$

The equation this time is:

$$\Delta\theta = \omega_1(\Delta t) + \frac{1}{2}\alpha(\Delta t)^2$$

$$= (10.5\ \text{rad/sec})(5.24\ \text{sec}) + \frac{1}{2}\left(-2.00\ \text{rad/sec}^2\right)(5.24\ \text{sec})^2$$

$$= 27.6\ \text{radians}$$

Note that the text's Solution Manual lists the solution to this as 27.4 radians. I suspect the difference is due to round-off error.