Ex 10-8
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In time Δt, find $\Delta\theta$ if starting from rest, $\omega_i = 0$

$$\Delta\theta = \omega_i \Delta t + \tfrac{1}{2}\alpha \Delta t^2$$

$\omega_i = 0$

$$\Delta\theta = \tfrac{1}{2}\alpha \Delta t^2$$

A torque is delivered, $\Sigma\tau = \tau = I\alpha$, $\alpha = \dfrac{\tau}{I}$

$$\therefore \quad \Delta\theta = \frac{\tau}{2I}\Delta t^2$$

Work done, $W = \tau\Delta\theta = \dfrac{\tau^2}{2I}\Delta t^2$

$$\therefore \quad W = \frac{(10\ N\cdot m)^2\ (8.0\ s)^2}{2(2.0\ kg\ m^2)}$$

can $W = 1600\ J$

Motor provides a non-conservative force, so use Cons.

$$\Delta K = K_f - K_i = W_{nc}$$

$K_i = 0$
start from rest

$$K_f = W_{nc} = 1600\ J$$

(Also use $K_f = \tfrac{1}{2} I \omega_f^2$, $\omega_f = \omega_i + \alpha\Delta t$)

Power: $P_{av} = \dfrac{W}{\Delta t} = \dfrac{1600\ J}{8\ s}$

$$P_{av} = 200\ W$$