Problem 1

The turntable on a record player consists of a disk 12 inches in diameter with a weight of 5lbs. The motor accelerates the turntable from rest to it's operating speed of 33.33 rpm in one rotation. What is the work done by the motor? What is the average torque the motor exerted?

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$33.33\ \text{rpm} \rightarrow 3.49\ \text{rad/s}$

$$W = \Delta KE + \cancel{\Delta PE}^{0}$$

$$(M)(\Delta\theta) = \frac{1}{2} I \omega_f^2 - \cancel{\frac{1}{2} I \omega_i^2}^{0}$$

$$(M)(2\pi) = \frac{1}{2}\left(\frac{1}{2}\left(\frac{5\text{lbs}}{32.2}\right)(.5\text{ft})^2\right)(3.49\ \text{rad/s})^2$$

$$\boxed{M = .0188\ \text{ft lbs}}$$