NAME _____   DATE _____

Scenario

A box of mass m is tied to a rope that is wrapped around a pulley. The pulley is initially rotating counterclockwise and is pulling the box up. The box slows down, stops instantaneously, and then moves back downward.

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Axis of Rotation

ω_0 v_0

Using Representations

PART A: i. The dot below left represents the box. Draw a free-body diagram showing and labeling the forces (not components) exerted on the box initially. Draw the relative lengths of all vectors to reflect the relative magnitudes of all the forces. Each force must be represented by a distinct arrow starting on and pointing away from the dot.

ii. On the diagram at right, draw and label the forces (not components) that are exerted on the pulley as it initially rotates. Clearly indicate at which point on the wheel each force is exerted. Draw each force as a distinct arrow starting on and pointing away from the point at which the force is exerted.
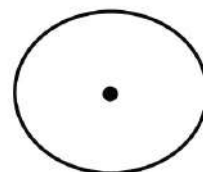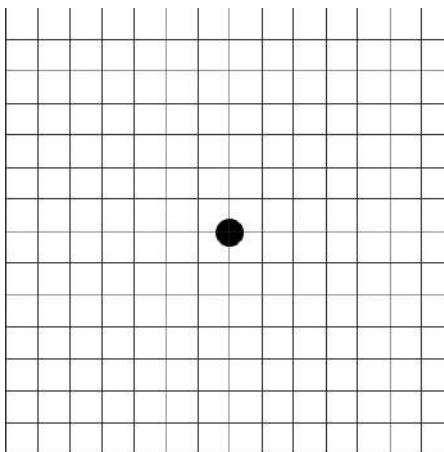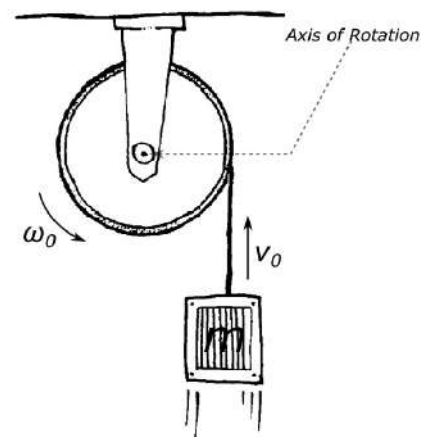
PART B: What force is responsible for the net torque on the pulley?

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PART C: Sketch a graph of the angular velocity as a function of time from the initial instant until the weight comes back down to the same height. (Take counterclockwise as positive.)
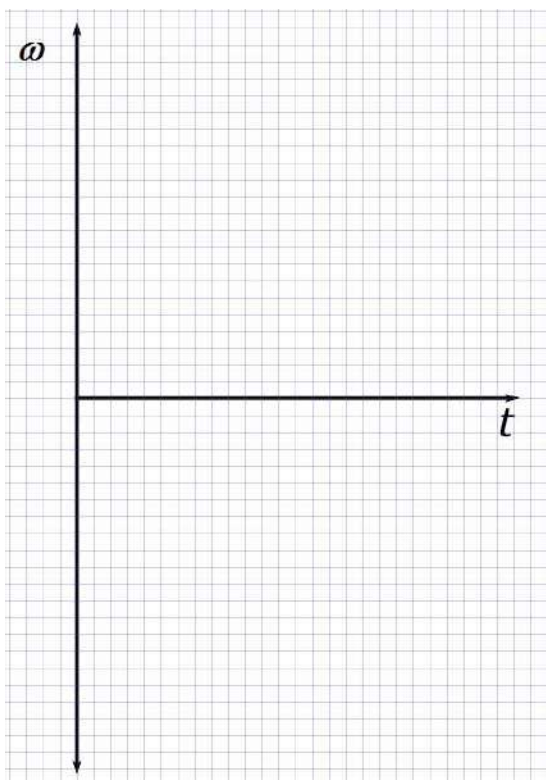
PART D: Sketch a graph of the angular acceleration of the pulley as a function of time for the same period.