

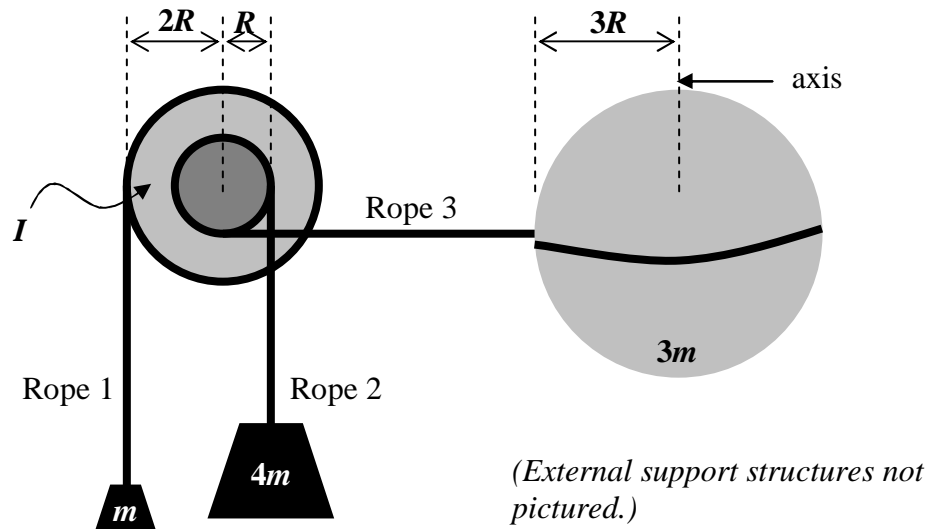
Newton's Second Law-La-Palooza

Physics 312

Date: _____

Name: _____

In the system pictured below, let T_1 , T_2 and T_3 represent the magnitudes of the tensions in Ropes 1, 3 and 3, respectively. The pulley is made of two concentric wheels, inner radius R and outer radius $2R$, rigidly attached to one another such that the rotational inertia of the entire, combined structure about its axis of rotation (out of the page) is I . The sphere is uniform and solid and is free to rotate about a vertical axis through its center. Let a represent the magnitude of the linear acceleration of the larger hanging block. All ropes are to be considered massless and inextensible. The system may be considered to be frictionless except as relating to the constraint that none of the ropes slip while in contact with rigid bodies.



Apply Newton's Second Law to this system and generate the equations of motion that fully describe the dynamics. Do **NOT** attempt to solve the equations. The correct answer to this question is a *set of equations*. Do **NOT** substitute any numerical values for physical quantities. Express your equations in terms of m , I , R , T_1 , T_2 , T_3 , g , a and any other necessary constants.

DRAW A CLEAR AND USEFUL FREE BODY DIAGRAM FOR EACH INERTIAL OBJECT IN THE SYSTEM.

CLEARLY INDICATE WHAT YOU CHOOSE TO BE THE POSITIVE DIRECTION OR SENSE FOR MOTIONS OF ALL OBJECTS.

SHOW WORK ON REVERSE AND ADDITIONAL SHEETS AS NECESSARY.