Name _____ Section _____

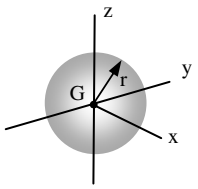
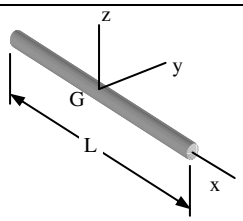
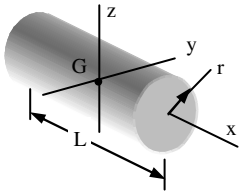
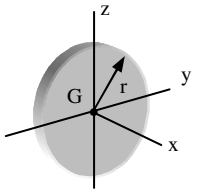
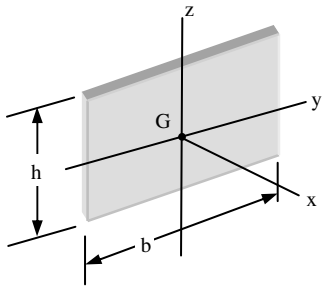
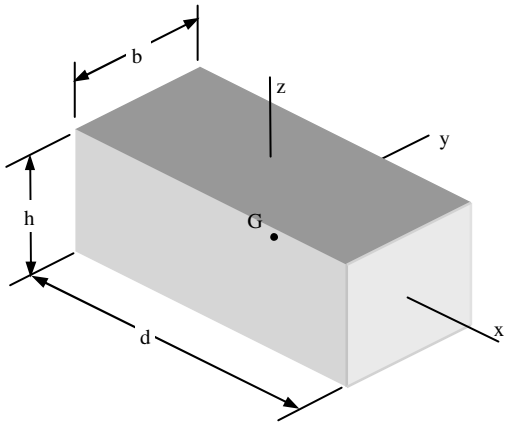
ES204
Examination III
February 8, 2008

Problem	Score
1	/30
2	/30
3	/40
Total	/100

Show all work for credit
AND
Turn in your signed help sheet

NOTE:
Set up all the equations first and save the solutions to the end.

Mass moment of Inertia of some Common Shapes

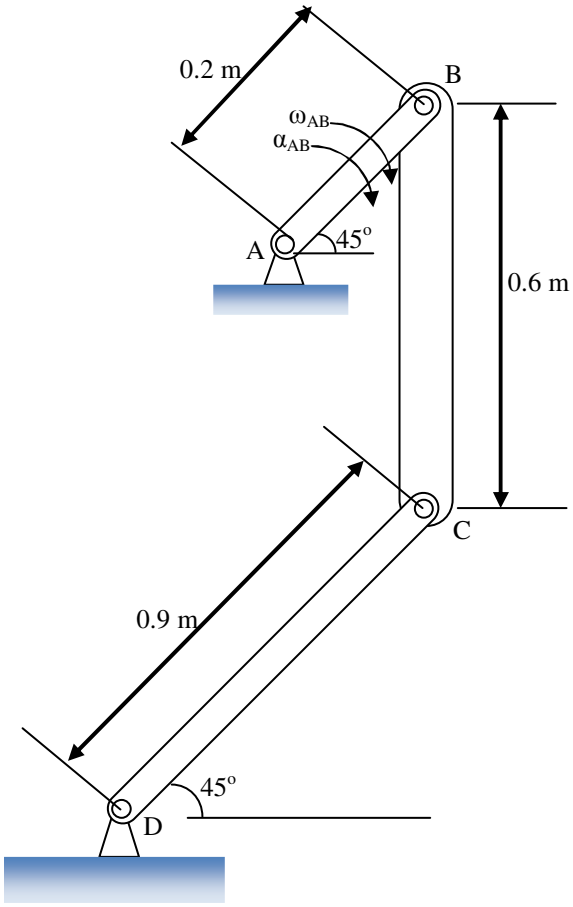
Solid Sphere $I_x = I_y = I_z = \frac{2}{5}mr^2$	
Slender Rod $I_y = I_z = \frac{1}{12}mL^2$	
Solid Circular Cylinder $I_x = \frac{1}{2}mr^2$ $I_y = I_z = \frac{1}{12}m\left(L^2 + 3r^2\right)$	
Thin Disk $I_x = \frac{1}{2}mr^2$ $I_y = I_z = \frac{1}{4}mr^2$	
Thin Rectangular Plate $I_x = \frac{1}{12}m\left(b^2 + h^2\right)$ $I_y = \frac{1}{12}mh^2$ $I_z = \frac{1}{12}mb^2$	
Brick $I_x = \frac{1}{12}m\left(b^2 + h^2\right)$ $I_y = \frac{1}{12}m\left(h^2 + d^2\right)$ $I_z = \frac{1}{12}m\left(b^2 + d^2\right)$	

Name _____ 30 pts

ES204 Examination III **Problem 1** February 8, 2008

Bar AB in the mechanism shown has an angular velocity of 3 rad/s (CW) and an angular acceleration of 12 rad/s^2(CW). Determine the necessary equations to find the angular velocity and angular acceleration of link BC and CD at this location.

Do not solve these equations. Your solution should consist of a list of unknowns and clearly numbered **scalar** equations.



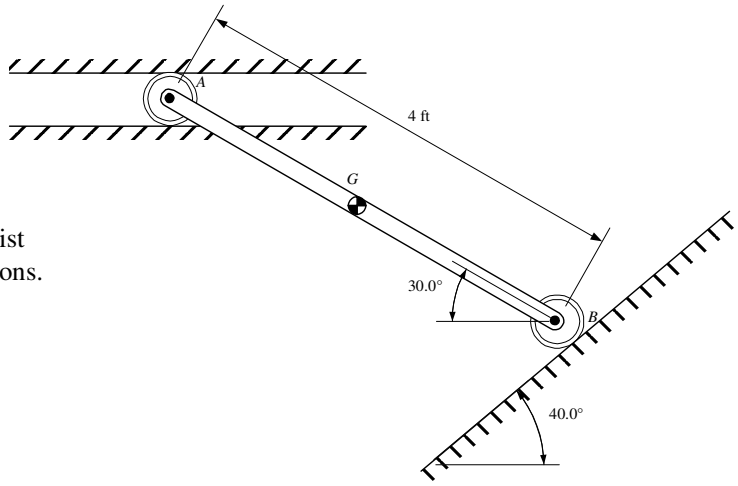
Name _____ 30 pts

ES204 Examination III **Problem 2** February 8, 2008

A 50 lb_f slender 4-ft uniform rod is released from rest from the position shown on the frictionless incline.

Determine the necessary equations to find:
a) the normal surface reaction forces at A and B,
b) the angular acceleration of the rod.

Do not solve these equations. Your solution should consist of a list of unknowns and clearly numbered **scalar** equations. The mass of each roller is negligible.



Name _____ /40 pts

ES204 Examination III **Problem 3** February 8, 2008

A cylinder has mass m_C and radius R. It rests on a sliding block whose mass is m_B. Starting at rest, a constant force P is applied as shown for a finite time interval t. Assume that the cylinder rolls without slipping, and that friction between the sliding block and the level ground is negligible. You may also assume that the cylinder does remain on the block. Write down, **but do not solve**, the equations you need to calculate:

(a) v_B, the velocity of the sliding block at time t.

(b) v_C, the velocity of the center of the cylinder at time t.

(c) ω, the angular velocity of the cylinder at time t.

(d) d, the distance the sliding block moves during the time interval t.

Knowns:
m_B, m_C, R, P, t