Mechanics **Name** :_____

Practice Test 2

1) Consider the following static systems. [10 pts each]

a. Pulley system shown with hanging mass $M = 10$ kg.

Determine T_1, T_2, T_3, T_4, T_5, T_6.

b. Mass M hanging from wires, one horizontal and one at angle θ with the ceiling.

Determine the tension in the each wire as a function of θ, g and M.

2) Consider the following kinetic systems. [10 pts each]

a. Three blocks $m_1 = 1\text{kg}$, $m_2 = 2\text{kg}$ and $m_3 = 3\text{kg}$ have a 12 Newton force applied to them. They slide across a frictionless surface.

Draw a free body diagram for each mass and determine the magnitude of each force on each mass.

b. A modified Atwood's machine with masses m_1, m_2 and m_3 is shown.

Determine the tensions T_1 and T_2 and the acceleration a in terms of m_1, m_2, m_3 and g.

3) 1-D Collisions. [20 pts]

A 5kg block moving at 4m/s to the right strikes a 1kg block moving at 10m/s to the left.

Determine the final velocities if the masses collide inelastically.

Determine the final velocities if the masses collide elastically.

Determine the final velocities if the masses collide super-elastically and double the system's KE in the collision.

4) Consider a ramp of variable angle θ and friction coefficients $\mu_s = 0.2$ and $\mu_k = 0.1$.

Determine the range of angles for which:

- objects will slide up the ramp and slide back down

- objects will slide up the ramp and stop

- moving objects will slide down the ramp without stopping

- moving objects will stop while sliding down the ramp

5) A block, mass $m = 1$ kg, slides from the top of a sphere, radius $r = 10$ meter beginning from a speed $v_0 = 2$ meters per second.

Determine the height at which the block loses contact with the sphere.