PHY 201 Quiz #8 **Name** _____

Score _____

Instructions:
1. Do all of your work on this sheet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place your **answers in a box**. Do not forget **units**!
5. If you need more space, you may use the back of the page and write **On back** in the problem space.

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1. **Multiple Guess (3 pts)** Find the answer which best fits the question and write it in the space provided.

a. The units of torque are
a) N/m. b) Nm. c) Nm/s. d) J. e) none of these.

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b. An ice skater spins on frictionless ice with her arms extended. She pulls her arms in toward her body. Angular momentum is conserved. So, as the moment of inertia is reduced, her angular velocity increases and she spins faster. Compared to the initial rotational kinetic energy, her final rotational kinetic energy is
a) the same b) smaller, because her moment of inertial is smaller. c) larger, because her angular speed is larger.

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c. When the distance between two masses is cut in half and one of the masses is doubled, the gravitational force between them is _____ the original force.
a) half b) the same as b) twice c) four times d) eight times
e) None of these.

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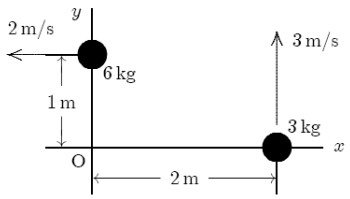
2. **Angular Momentum (4 pts)**

a. Two objects are moving in the *x*-*y* plane. Find the magnitude of their total angular momentum about the origin.



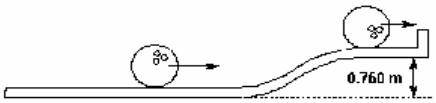
b. An airport baggage carousel rotates with angular speed of 0.20 rad/s. The moment of inertia of the carousel is 1500 kg m^2. Ten pieces of baggage with an average mass of 15 kg each drop vertically onto the carousel and come to rest 2.0 m from the axis of rotation. Assuming no net external torque acts on the system, what is the final speed of the carousel and baggage?

3. **Problems (13 pts)** .

a. The angular position of a point on a wheel of radius 3.0 cm and mass 5.0 kg is given by $\theta = 2.0 - 3.0t + 4.0t^2$ rad. If the wheel is
in the shape of a solid disk, then what torque is needed to maintain its constant angular acceleration?

b. Three masses lie on a line: 10.0 kg at x = 0.0 m; 5.0 kg at x = 2.0 m and, 2.0 kg at x = 3.0 m. Find the gravitational force on the 5.0 kg mass. [$G = 6.67\times10^{-11}$ Nm^2/kg^2]

c. A bowling ball, moving with a speed of 3.50 m/s, encounters a 0.760 m vertical rise on the way to the ball rack. Assuming that the mass is distributed uniformly and the ball rolls without slipping, find the translational speed of the ball at the top of the rise.



d. The moon's mass and radius are about 1/100th and 1/4th those of the Earth, respectively. If a person weighs 600 N on the Earth, then what do they weigh on the moon?

e. A person holds a 150 N ball with the forearm horizontal. The elbow is 0.030 m from the flexor muscle and 0.330 m from the ball. The center of mass of the forearm is 0.090 m from the elbow. If the forearm weighs 25.0 N, find the force exerted by the flexor muscle.