PHY 201 Quiz #7 **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 (4 pts)** Find the answer which best fits the question and write it in the space provided.

a. When one stretches liquorice, the strain is given by
a) the change in length per original length. b) the applied force per unit area. c) the restoring force. d) 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) larger, because her angular speed is larger.
c) smaller, because her moment of inertial is smaller.

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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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d. The drawing shows a top view of several hockey pucks and three forces that act on each one. Which one of the five pucks is in equilibrium?

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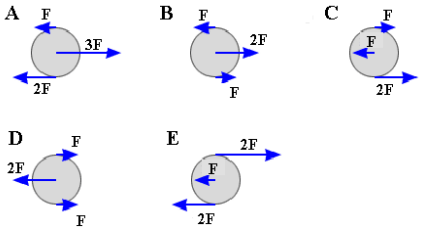
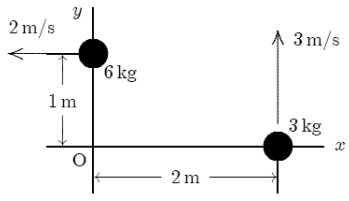


2. **Angular Momentum (3 pts)**
Two objects are moving in the *x*-*y* plane. Find the magnitude of their total angular momentum about the origin.



Bonus: Let $\mathbf{r} = 3\mathbf{i} - 5\mathbf{j}$ m and $\mathbf{p} = 2\mathbf{i} + 4\mathbf{k}$ kg m/s. Compute $\mathbf{r} \times \mathbf{p}$.

What nuclear material was used in the Nagasaki bomb?

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

a. 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]

b. 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?

c. After a fall, a 95 kg rock climber finds himself dangling from the end of a rope that had been 15 m long and 9.6 mm in diameter, but which has stretched by 2.8 cm. Determine Young's modulus for the rope.

d. 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?

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.