UCONN Physics 1201Q: Unit 7 **Name: _____**
Collisions & Center of Mass **Date: _____ Period: _____**
Worksheet IV **/30**

Read each question carefully. Show all of your work and the equations used. Don't forget units and circle the final answers.

1. A 9800 N car traveling at 22 m/s strikes a concrete bridge support and completely halts in 0.5 sec.
   a) Determine the magnitude of the force acting on the car. [44,000 N]2pts

   b) Suppose a barrier, which contained material gradually crushed during impact so that the stopping time was increased to 3 sec, had surrounded the bridge support. What would be the magnitude of the new force? [7,333.33 N]2pts

2. A 1 kg object traveling at 1 m/s collides head-on with a 2 kg object initially at rest. If the collision is completely inelastic, determine the velocity of the objects after impact and how much kinetic energy was lost during the collision. [0.33 m/s , 0.33665 J]5pts

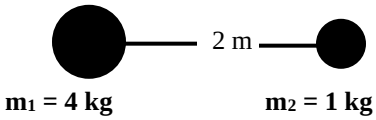
3. Max, who has a mass of 80 kg, and his girlfriend, Allison, who has a mass of 50 kg, are wearing skates and are standing together on a frozen lake. If they push apart and Max has a velocity of 0.72 m/s in the opposite direction of Allison, what is Allison's velocity? (Neglect friction) [1.152 m/s] 2pts

4. Stranded on a frozen and frictionless lake, David, who has a mass of 55 kg, takes off his new 0.15 kg Michael Jordan tennis shoes that he got from Santa Claus for Christmas. He throws the shoes horizontally directly away from the shore with a speed of 2 m/s. If David is 5 m away from shore, how long does it take before he reaches land? [916.67 sec, 15.278 min]2pts

5. For a movie scene, a 60 kg, Jenna drops from a tree onto a 50 kg sled, moving 6 m/s toward the shore of a frozen lake.
   a) What is the speed of the sled after Jenna is on board? [2.73 m/s]2pts

   b) If the sled hits the bank and stops, but Jenna keeps going, then at what speed does she leave the sled? [5.005 m/s] 2pts

6. Locate the center of mass of the two-particle system shown in the figure below from the reference of the 4 kg mass.
[COM = (0.4,0.00)]4pts



7. The mass of the Sun is 329,390 Earth masses, and the mean distance from the center of the Sun to the center of the Earth is 1.496×10^8 km. Treating the Earth and Sun as particles, with each mass concentrated at its respective geometric center; how far from the center of the Sun is the center of mass of the Earth-Sun system? Compare this distance with the mean radius of the Sun (6.96×10^5 km). [454.17 km , 1/1532] 5pts

8. Where is the center of mass of the three-particle system shown below using the origin as the reference point?
[COM = (-2.14, -0.0476)]4pts