Name:_____

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 20 points. You must show your work in a logical fashion starting with the correctly applied physical principles which are on the last page. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

1. A woman at the airport pulls her 20.0kg suitcase with a force of 60.0N at an angle of 60.0˚ above horizontal. The frictional force on the suitcase is 20.0N. Find (a)the normal force on the suitcase and (b)the acceleration of the suitcase.

2. Earth is kept in orbit by the gravitational force exerted on it by the sun. Does Earth exert a gravitational force on the sun? If so, which force is larger, the force the sun exerts on Earth or the force that Earth exerts on the sun? Explain.

3. Dish Network provides television signals from their satellites to homes equipped with small fixed dish antennas. Since the antennas are fixed, the satellite must be at the same point in the sky at all times, so it must orbit with the same period that the earth spins (24h). Suppose a satellite has a mass of 75.0kg and orbits at an altitude of 3.58×10^7m. Find (a)the orbital radius of the satellite (b)the speed of the satellite, and (c)the gravitational force that Earth exerts on the satellite.

4. A 0.150kg baseball thrown by a pitcher leaves his hand 2.00m above the ground at a speed of 102mph (45.6m/s). It is caught by the catcher 60.5ft (18.4m) away at a height of 1.00m and a speed of 97.0mph (43.4m/s). Find (a)the initial kinetic energy of the ball, (b)the final kinetic energy of the ball, (c)the net work done on the ball, (d)the net work done by gravity and (e)the work done by the resistive forces that act on the ball.

5. A 10.0g bead slides down a frictionless wire starting at a height $h = 4R$ where the radius R = 35.0cm. Find the speed of the bead at the top of the loop.