Exam #1: Newton's Laws and Equations of Motion

Name: _____

1) A cheetah is chasing down a gazelle which is running at 16.0 m/s to the east. The cheetah is 400 m south of the gazelle and can run at a sustained speed of 18.0 m/s. Assuming that the gazelle continues at the same speed and direction, what direction must the cheetah run to head off the gazelle? (3 points)

2) You are playing darts, standing 4.0 m from the dart board. If you throw the dart at 10.0 m/s, how high above the bull's eye would you need to throw the dart so that you hit the bull's eye? (4 points)

3) A circular water fountain has several jets at the center that shoot water at a 45° angle, what must the speed of the water coming out of the jets be if the radius of the fountain is 3.5 m and you want to keep all of the water inside the fountain?(2 points)

4) A ball starts at the top of a frictionless incline of height 26 cm. The incline is at 17° with respect to the horizontal. The ball rolls down the incline and then onto carpet where friction slows the ball down to a stop. If the ball comes to a stop 45 cm from the bottom of the incline, what is the coefficient of friction between the ball and the carpet? (6 points)

5) A sign is hung from a horizontal pole with two ropes. One rope is hanging at 20° below the horizontal and the other rope is hanging at 90° below the horizontal. If the sign has a mass of 10 kg, what is the tension in each rope? (4 points)