**PARTIAL CREDIT** will be given so do what you can and make sure that you show all work for each problem. **No credit will be given if no work is shown**. The point value of each question is indicated.

1. A rock dropped from a cliff falls one-third of its total distance to the ground in the last second of its fall. Determine the height of the cliff. (10 pts)

2. A train pulls away from a station with a constant acceleration of 0.4 m/s². A passenger arrives at the track 6.0 s after the end of the train has passed the very same point. What is the slowest constant speed at which she can run and catch the train? (10 pts)

3. Suppose that the clock on our lecture room has a minute-hand length of 5.0 cm. (Use a coordinate system with the origin at center of clock and +x axis along the 3PM direction and the +y direction along the 12PM direction) (15pts)

    a) Calculate the displacement of the tip of the minute hand from the 3 PM mark to the 8 PM mark. Label the vectors on clock diagram.
    b) Calculate the average acceleration of the tip of the minute hand from the 3 PM mark to the 8 PM mark. Label the vectors on the clock diagram.
    c) Calculate the angular velocity of the tip of the minute hand.
    d) Calculate the linear speed of the tip of the minute hand.
    e) Calculate the radial acceleration of the tip of the minute hand.
    f) Calculate the tangential acceleration of the tip of the minute hand.

4. A snowball rolls off a barn roof that slopes downward at an angle of 40° (see figure below).The edge of the roof is 16.0 m above the ground, and the snowball has a speed of 8.00 m/s as it rolls of the roof. (10 pts)

v_o= 8.00 m/s

40°

16.0 m

5.0 m
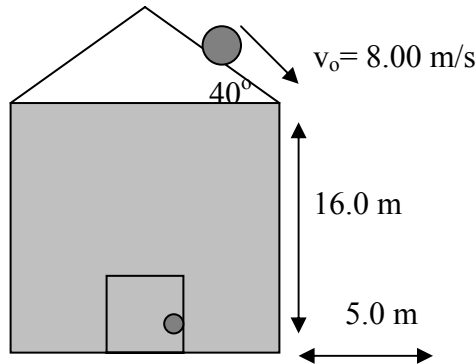
a) How far from the edge of the barn does the snowball strike the ground if it doesn't strike anything else while falling?
b) A man 1.9 m tall is standing 5.0 m from the edge of the barn. Will he be hit by the snowball?

5. A swimmer heads directly across a river swimming at 1.6 m/s relative to the water. She arrives at a point 40 m downstream from the point directly across the river, which is 80 m wide.
    a) What is the speed of the river current?
    b) What is the swimmer's speed relative to the shore?
    c) In what direction should the swimmer head to arrive at the point directly opposite her starting point?