Test 1

Study Set Questions

1. (2.4) Starting from a pillar, you run 200 m east (the +x direction) at an average speed of 5.0 m/s and then run 280 m west at an average speed of 4.0 m/s to a post.
   a. Calculate your average speed from pillar to post. 4.4 m/s
   b. Calculate your average velocity from pillar to post. -0 73 m/s

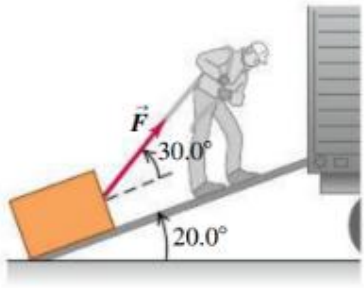
2. (2.24) A car sits on an entrance ramp to a freeway, waiting for a break in the traffic. Then the driver accelerates with constant acceleration along the ramp and onto the freeway. The car starts from rest, moves in a straight line, and has a speed of 20 m/s when it reaches the end of the 120-m-long ramp.
   a. What is the acceleration of the car? 1.67 m/s^2
   b. How much time does it take the car to travel the length of the ramp? 12s
   c. The traffic on the freeway is moving at a constant speed of 20 m/s. What distance does the traffic travel while the car is moving the length of the ramp? 240 m

3. (3.16) On level ground a shell is fired with an initial velocity of 71.0 m/s at 55.9° above the horizontal and feels no appreciable air resistance.
   a. Find the horizontal and vertical components of the shell's initial velocity. 39.8 m/s, 58.8 m/s.
   b. How long does it take the shell to reach its highest point? 6s
   c. Find its maximum height above the ground. 176 m.
   d. How far from its firing point does the shell land? 478 m.
   e. At its highest point, find the horizontal and vertical components of its acceleration and velocity.

4. (3.12) You throw a basketball with an initial upward velocity component of 8.0 m/s and a horizontal velocity component of 12.0 m/s. Ignore air resistance.
   a. How much time is required for the basketball to reach the highest point of the trajectory? 0.816s
   b. How high is this point? 3.27 m
   c. How much time (after it is thrown) is required for the basketball to return to its original level? 1.63s
   d. How far has the basketball traveled horizontally during this time? 19.6m

5. (3.9) A physics book slides off a horizontal tabletop with a speed of 1.40 m/s. It strikes the floor in 0.320 s. Ignore air resistance. Find
   a. The height of the tabletop above the floor. -0.502m
   b. The horizontal distance from the edge of the table to the point where the book strikes the floor. 0.448m
   c. The horizontal and vertical components of the book's velocity, and the magnitude and direction of its velocity, just before the book reaches the floor. 1.40 m/s,-3.14 m/s

6. (4.4) A man is dragging a trunk up the loading ramp of a mover's truck. The ramp has a slope angle of 20.0°, and the man pulls upward with a force F whose direction makes an angle of 30.0° with the ramp.
    a. How large a force F is necessary for the component F_x parallel to the ramp to be 90.0 N?104 N.
    b. How large will the component F_y perpendicular to the ramp be then? 52.0 N.



7. (4.12) A crate with a mass of 32.0 kg initially at rest on a warehouse floor is acted on by a net horizontal force of 140 N.
    a. What acceleration is produced? 4.38 m/s^2
    b. How far does the crate travel in 13.0 s? 370 m
    c. What is its speed at the end of 13.0 s? 56.9 m/s

8. (5.30) Some sliding rocks approach the base of a hill with a speed of 13 m/s. The hill rises at 43° above the horizontal and has coefficients of kinetic friction and static friction of 0.43 and 0.61, respectively, with these rocks.
    a. Find the acceleration of the rocks as they slide up the hill. 9.69 m/s^2
    b. Once a rock reaches its highest point, will it stay there or slide down the hill? If it stays, show why. The rock will slide
    c. If it slides, find its acceleration on the way down. 2.31 m/s^2

9. (5.58) A bowling ball weighing 71.2 N is attached to the ceiling by a 3.80 m rope. The ball is pulled to one side and released; it then swings back and forth as a pendulum. As the rope swings through the vertical, the speed of the bowling ball is 4.20 m/s.
    a. At this instant, what is the acceleration of the bowling ball, in magnitude and direction? 4.64 m/s^2, upward
    b. At this instant, what is the tension in the rope? 105N

10. (5.16) An 8.00 kg block of ice, released from rest at the top of a 1.31 m-long frictionless ramp, slides downhill, reaching a speed of 2.59 m/s at the bottom.
    a. What is the angle between the ramp and the horizontal? 15.1 degree
    b. What would be the speed of the ice at the bottom if the motion were opposed by a constant friction force of 10.0 N parallel to the surface of the ramp? 1.84 m/s