Physics 125: Classical Physics A

1 Practice Problems for Midterm Exam 1

Problem 1

The Figure 1 depicts velocity as a function of time for a short run. Find:

a) The acceleration at $t = 5$ seconds.

b) The acceleration at $t = 15$ seconds.

c) The acceleration at $t = 25$ seconds.

d) The total distance covered in the 50 second run.

e) The average velocity for the 50 second run.

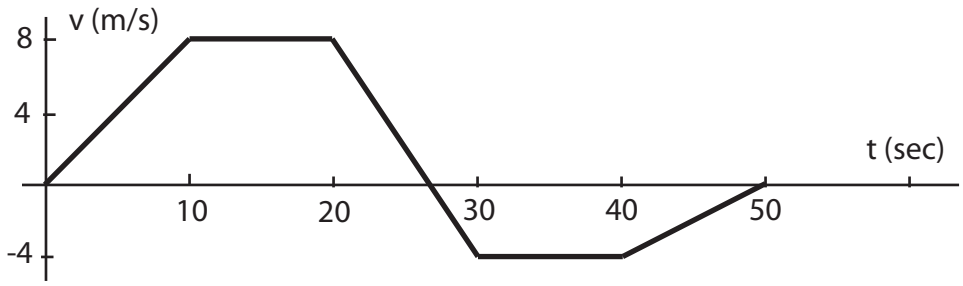

Figure 1: $v - t$ graph

Problem 2

On a short hike a student walks 3.0 km 30^0 South of East then 3.0 km due North then 2.0 km 30^0 West of North then 4.0 km 37^0 South of West. Where is she relative to her starting point? Give distance and direction.

Problem 3

An airplane is heading North with the wind of velocity 30 km/h blowing in the direction of 45^0 South from West. What is the speed of the plane relative to Earth if its speed relative to the air is 300 km/h ?

Problem 4

Sketch graphs of $x(t)$, $v(t)$, and $a(t)$ for a ball thrown straight up in the air with an initial speed of 5 m/s. Label the graphs and use scales showing appropriate values.

Problem 5

An object which was thrown vertically upward from the edge of the roof of a building is observed to be moving at 10.0 m/s downward as it passes the point from which it was thrown.

a) At what velocity does it hit the ground 80.0 m below the roof?

b) What is the time interval between its passing [downward] the point of the origin and hitting the ground?

c) What is the maximum distance above the point of origin reached by the object?

Problem 6

A projectile is fired from the top of a cliff at an angle of 37^0 to the horizontal as shown in Figure 2 with an initial velocity of 150 m/s. It lands on a horizontal plane 2400 m from the base of the cliff.

a) How long is the projectile in the air?

b) How high is the cliff?

c) What is the magnitude and direction of the velocity of the projectile just before it hits the ground?

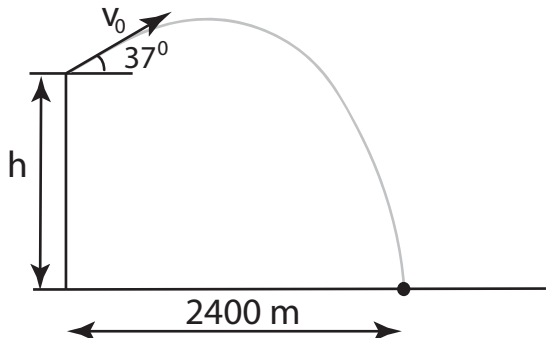

Figure 2: Projectile trajectory

Problem 7

Shown in the figure 3 is a system of blocks connected by a massless string running over a massless pulley. The coefficient of friction on the ramp is $\mu_k = 0.1$. The 8 kg block is sliding *down* the ramp. Find all the following:

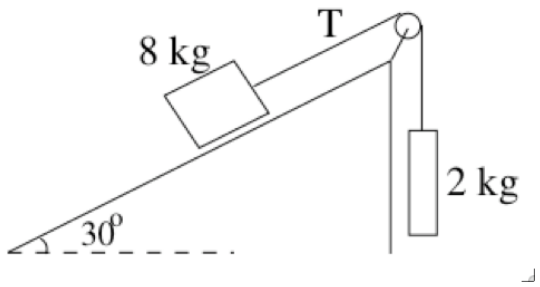

Figure 3: To problem 7.

a) The normal force on the sliding block.

b) The acceleration of the system.

c) The tension, T, in the cord.

Problem 8 (Ex.5.25)

A passenger on a carnival Ferris wheel moves in a vertical circle of radius R with constant speed v. Assuming that the seat remains upright during the motion, derive expressions for the force the seat exerts on the passenger at the top of the circle and at the bottom.