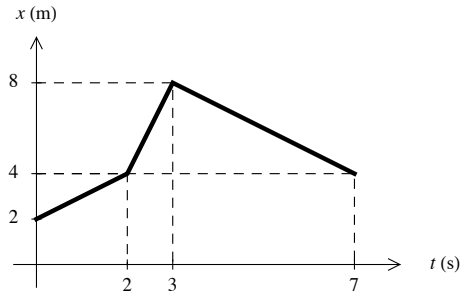
Chapter B - Problems

Blinn College - Physics 2425 - Terry Honan

Problem B.1



(a) What is the average velocity between 0 s and 2 s, between 3 s and 7 s, between 2 s and 7 s?

(b) What is the instantaneous velocity at 1 s and and at 4 s?

(c) What is the average acceleration between 1 s and 4 s?

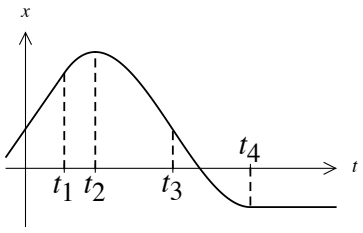
(b) What is the instantaneous acceleration at 1 s and at 4 s?

Problem B.2

A particle moves in one dimension. It's position as a function of time is given, in SI units, by: $x(t) = 2\,t^4 - 5\,t^2 + 18$.

(a) What is the average velocity between 2s and 4s?
(b) What is the instantaneous velocity at 3s?
(c) What is the average acceleration between 2s and 4s?
(d) What is the instantaneous acceleration at 3s?

Problem B.3



The above diagram is a graph of position versus time. For $t < t_1$ the graph is a straight line. For $t > t_4$ the graph is a horizontal line. (t_3 is a point of inflection.)

(a) Where is the velocity zero? Where is it positive? Where is it negative?

(b) Where is the acceleration zero? Where is it positive? Where is it negative?

Problem B.4

Suppose the maximum stopping acceleration for a car on a given surface is fixed. Suppose the minimum stopping distance for this car moving at 30 mi/hr is 35 ft.
(a) What is its minimum stopping distance for this car travelling at 60 mi/hr?
(b) What is its stopping acceleration in ft$/s^2$?

Problem B.5

A particle moves along a line with a constant acceleration. At $t = 0$ it is at $x = 0.3$ m moving in the positive direction at $1.2\,m/s$. If at $t = 2$ s it is at $x = -0.5$ m then what is its acceleration.

Problem B.6

A drag racer accelerates uniformly from rest at $8\ \frac{\text{m}}{s^2}$ over a distance of 400 m.

(a) What is the velocity of the car after the acceleration?
(b) How long does it take for the car to accelerate?

Problem B.7

A ball is thrown straight upward from the ground at the base of a building. A person hanging out a 4 m high window catches the ball 1.5 s later.
(a) What was the velocity of the ball just after it was thrown?
(b) What was the velocity of the ball just before it was caught?

Problem B.8

A river flows at a rate of $5\ \frac{\text{m}}{\text{s}}$. A person standing on a bridge 3 m above the water wants to drop a ball into a boat that moves with the river's current. How far upstream should the boat be from the stream when the person drops the ball for it to land in the boat?

Problem B.9

A ball is thrown vertically upward at an initial speed of $20\ \frac{\text{m}}{\text{s}}$ from the ground.

(a) What is the maximum height reached by the ball and how long does it take for the ball to reach the maximum height?
(b) 3 s after the ball is thrown, what is its height, velocity and acceleration?

Problem B.10

A helocopter accelerates straight upward from rest on the ground with a constant acceleration of $4\ \frac{\mathrm{m}}{s^2}$. Three seconds after leaving the ground a crate is dropped from the helicopter. How long does it take fo rthe crate to hit the ground after it is dropped.

Problem B.11

An object is dropped from the roof of a building. A person looking out a 25m high window hears it hit the ground 1.5 s after it passes the window. How high is the roof above the ground? You may neglect the travel time of the sound.