Calculus

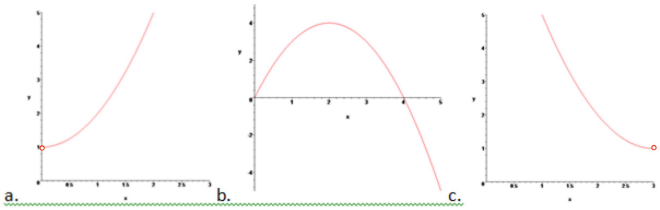
Chapter 4: Applications of Derivatives

Lesson 4: Distance, Velocity, Acceleration, and Rectilinear Motion

Question #1

Reference Q.556

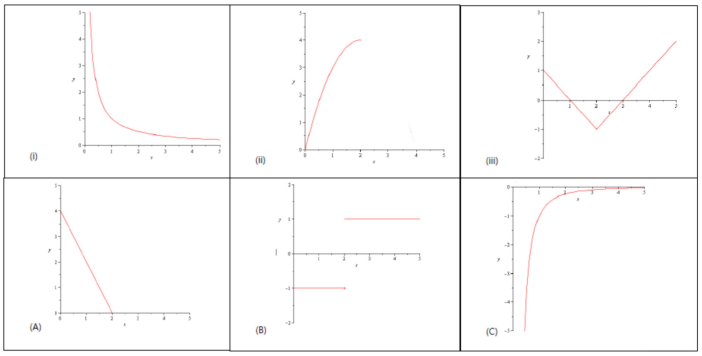
For the following graphs of distance versus time of an object, state when the object:
-Has a positive velocity
-Has a negative velocity
-Is increasing in velocity (positive acceleration)
-Is decreasing in velocity (negative acceleration)



Question #2

Reference Q.557

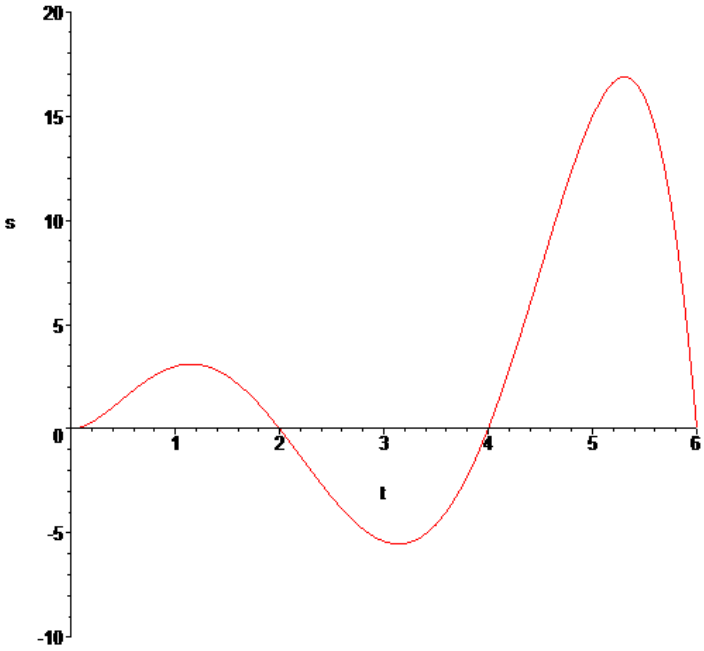
Match the following distance x time graphs with their velocity x time graphs:



Question #3

Reference Q.558

The following graph shows the position vs time of an object. Sketch their corresponding graphs of velocity and acceleration.



Question #4

Reference Q.559

For the following distance functions, find $v(2)$ and $a(2)$

$d(t) = t^2(2t - 3)$

a. $v(2)$

b. $a(2)$

Question #5

Reference Q.560

A rock is thrown straight up into the air and has a height given by the equaion $h(t) = 235 + 5t - 16t^2$. Find the velocity and the acceleration of the rock at time $t = 2$.

Question #6

Reference Q.561

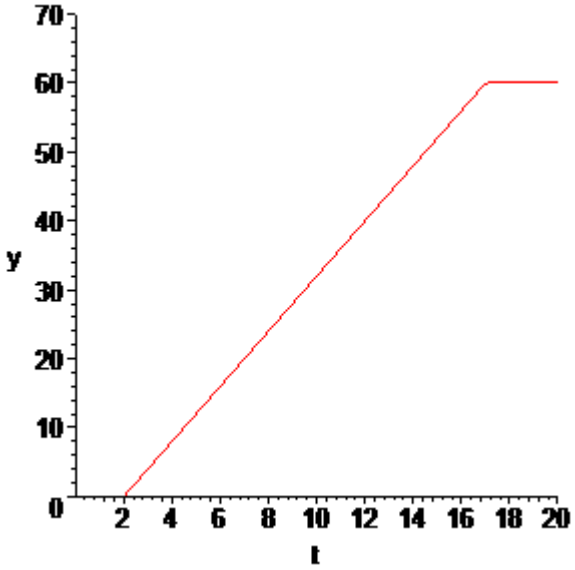
A particle is moving in a horizontal line according to the equation $x = 3t^3 - 15t^2 + 18t.$

Determine when the particle is moving left, moving right, and when it is stopped. Also, determine when the particle changes direction, if it does.

Question #7

Reference Q.562

a. The height of a person running up a flight of stairs, and then reaching the top, is graphed below.



b. Estimate their running speed by sketching a graph of speed versus time.

Question #8

Reference Q.563

$f(x) = 2x^2$ for the interval $[0, 2]$

a. a) Find the average rate of change over the interval

b. b) Find the instantaneous rate of change at $x = 1$

c. c) Find a formula for the instantaneous speed as a function of x.

Question #9

Reference Q.9208

A very worried person is pacing along a straight line. Their position is given by: $x(t) = sin^2 t$. What function describes their acceleration?

Question #10

Reference Q.9207

Carey is driving on a very straight highway, not paying attention enough to maintain a constant velocity. Her velocity is given by $v(t) = te^{\sin t}$ (t is in hours) - what is her acceleration at $t = 2\pi$?

Question #11

Reference Q.9209

Martin spends his Saturdays wandering around a forest. On the twenty first of May, his position could be described as $x(t) = t^5 - 4t^4 + 4t^3 - 8t^2 + 20t$, where t is in hours, $x(t)$ is in kilometres, and $x(0) = 0$ is where he parked his car. At what moment in the first three hours is he walking the fastest?

Question #12

Reference Q.9210

A frantic fly behaves according to the position function $x(t) = t \sin t$, where t is in seconds and $x(t)$ is in metres. For what values of t, $0 \leq t \leq 2$, is the fly at rest?