3.3 Velocity and other Rates of Change

NAME:_____

Corrective Assignment

DATE:_____

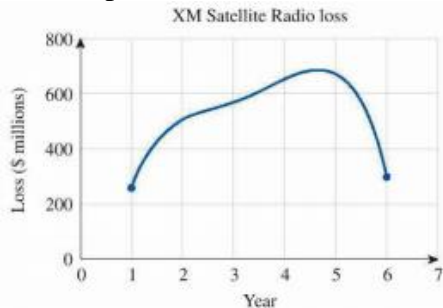**Use the information given to answer the following.**

1. The graph shows the approximate annual loss $L(t)$ of XM Satellite Radio for the period 2001-2006 where $t = 1$ represents the start of 2001

XM Satellite Radio loss

a) What year does $L'(t) = 0$?

b) Is $L'(4)$ positive, negative, or zero?

c) Find the average rate of change from 2005 to 2006.

2. A particle moves along a line so that its position at any time $t \geq 0$ is given by the function $s(t) = t^3 - 8t^2 + 20t - 16$ where s is measured in meters and t is measured in seconds.

a) Find the instantaneous velocity at any time t.

b) Find the acceleration of the particle at any time t.

c) When is the particle at rest?

d) What is the displacement of the particle for the first 3 seconds?

3. The following table shows Facebook members, n, in millions over time, t, where ($t = 1$ represents 2005)

Year t (since 2004)	1	2	3	4
Facebook Members n (millions)	1	5.5	12	58

a) Approximate $P'(3.5)$. Label and justify!

4. The position, in meters, of a body at time $t \geq 0$ measured in seconds is $s(t) = t^3 - 6t^2 - 36t$. Find the body's acceleration each time the velocity is zero.

5. The following table shows US oil imports from Mexico, for 2001-2007 ($t = 1$ represents 2001)

t (year since 2000)	1	3	5	7
P (million gallons/day)	1.35	1.55	1.5	1.6

b) Approximate $P'(2)$. Label and justify!

6. A particle P moves on the number line. The graph $s = f(t)$ shows the position of P as function of time t.
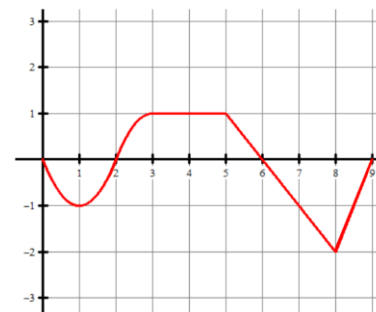
a) When is P moving to the left?

b) When is P moving to the right?

c) When is P standing still?

d) Graph the particle's velocity where defined.

7. The cost (in dollars) of producing x units of a certain commodity is $C(x) = 5000 + 10x + 0.05x^2$.

a) Find the instantaneous rate of change when $x = 100$.

b) What is the average rate of change of C with respect to x when the production level is changed from $x = 10$ to $= 20$?

8. The figure shows the velocity $v = \frac{ds}{dt} = f(t)$ of a body moving along a coordinate line in meters per second.

a) When does the body reverse direction?
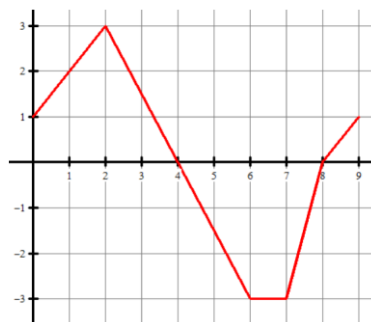
b) When is the body moving at a constant speed?

c) What is the body's maximum speed?

d) At time interval(s) is the body slowing down?

9. A rock thrown vertically upward from a 7 meter alien on the moon at a velocity of 48 meters per second reaches a height of $s(t) = 7 + 48t - 0.8t^2$ meters in t seconds.

a) Find the rock's velocity and acceleration as functions of time.

b) How long did it take the rock to reach its highest point?

10. The data in the table gives selected values for the velocity, in meters per minute, of a particle moving along the x-axis. The velocity v is a differentiable function of time t.

time, t	0	2	6	9	12
velocity, $v(t)$	-4	2	5	-3	-6

a) At $t = 0$, is the particle moving to the right or left? Explain.

b) Is there a time during the time interval $0 \le t \le 12$ minutes when the particle is at rest? Justify.

c) Use the data from the data to approximate $v'(4)$. Label.

ANSWERS TO CORRECTIVE ASSIGNMENT

1. a) ≈ 2004.7
   b) positive
   c) ≈ -350 million dollars per year

2. a) $v(t) = 3t^2 - 16t + 20$
   b) $a(t) = 6t - 16$
   c) $t = \frac{10}{3}$ and 2
   d) 15

3. a) $\frac{58-12}{4-3} = 46$ million FB members per year

4. 24 meters per second^2

5. $\frac{1.55-1.35}{3-1} = 0.10$ million gallons per day per year

6. a) (0,1) and (5,8)
   b) (1,3) and (8,9)
   c) (3,5)
   d)

7. a) 20 dollars per unit
   b) $\frac{115}{10}$ dollars per unit

8. a) $t = 4$ and 8
   b) (6,7)
   c) 3 meters per second
   d) (2,4) and (7,8)

9. a) $v(t) = 48 - 1.6t$
      $a(t) = -1.6$
   b) $t = 30$ seconds

10. a) left because velocity is negative
    b) yes, between (0,2) and (6,9) sign changes so it must cross zero
    c) $\frac{5-2}{6-2} = \frac{3}{4}$ meters per minute^2