DATE: _____

1. The height of a rocket at time $t \geq 0$ is given by $x(t) = 80t - 12t^2 + 8$.

a) Find the average velocity of the rocket from time $t = 4$ to $t = 5$.

$$V_{avg} = \frac{x(5) - x(4)}{5 - 4}$$

$$= \frac{108 - 136}{1}$$

$$= -28$$

b) Find the instantaneous velocity of the rocket at time $t = 4$.

$$v(t) = x'(t)$$

$$= 80 - 24t$$

$$v(4) = 80 - 24(4)$$

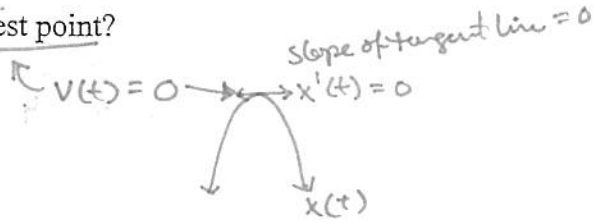
$$= -16$$

c) How long did it take the rocket to reach its highest point?

$$x'(t) = 0$$

$$80 - 24t = 0$$

$$t = 10/3$$



d) Find how high the rocket traveled.

$$x(10/3) = 80(10/3) - 12(10/3)^2 + 8$$

$$x(10/3) = \frac{424}{3}$$

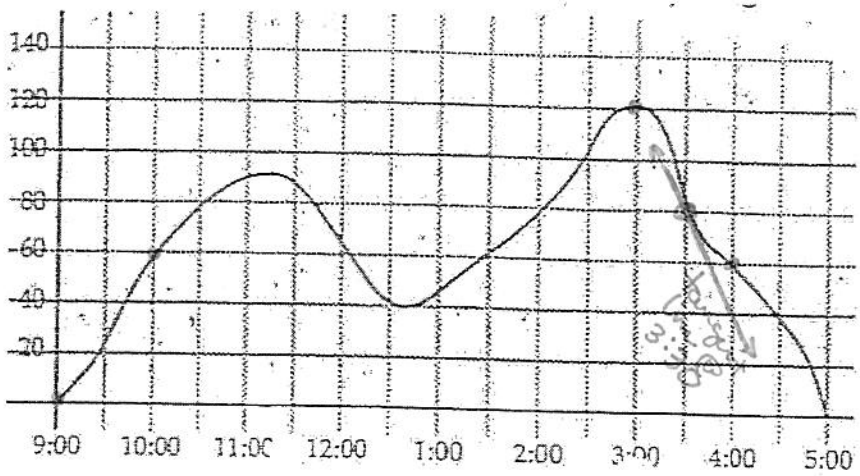
e) Find the acceleration of the rocket at time $t = 4$.

$$a(t) = v'(t)$$

$$a(t) = -24$$

$$a(4) = -24$$

2. A salesman travels among several towns located next to a straight highway. The graph below gives the salesman's distance from his home (in miles) at a given time on Friday.



a) What was the salesman's average speed from 9 AM to 10 AM?

$|v_{avg}|$ = avg speed

$= \frac{60-0}{10-9} =$ 60 miles/hr

b) What was the salesman's average speed from 3 PM to 4 PM?

$|v_{avg}|$ = avg speed

$= \left|\frac{120-60}{3-4}\right| = |-60|$ miles/hr = 60 miles/hr

c) The salesman was clocked (and pulled over) by a policeman at 3:30 PM. How fast was he driving at this time?

↑ at instant in time (instantaneous)

instantaneous speed @ 3:30pm → slope of tangent line (estimate from graph)

$\left|\frac{80-40}{3-3.5}\right| = \frac{40}{1/2} =$ 80 miles/hr

3. The following data give the distance (in feet) at a given time (in seconds of a vehicle from its starting position. The vehicle travels in a straight line.

Time(*sec*)	0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6
Distance (*ft*)	0	56	105	146	180	208	230	246	257	263

a) Find the average velocity over the first 263 feet.

$v_{avg} = \frac{263-0}{3.6-0} = 73.056$ ft/sec

b) Find the average velocity from $t = 1.2$ to $t = 2.8$

$v_{avg} = \frac{246-146}{2.8-1.2}$

$= 62.5$ ft/sec