August 31

SWBAT:

Use calculus to interpret the position, velocity and acceleration.

Given velocity, how do you know when the acceleration is positive? negative?	when velocity is increasing, acceleration is positive when velocity is decreasing, acceleration is negative
Given velocity, how can you find the average acceleration? on $[a, b]$	find the slope through 2 points $\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{v(b) - v(a)}{b - a}$
Given velocity, how can you find the instantaneous acceleration at a point?	take the derivative + evaluate at a point $v'(t) = a(t)$ $v(t) = t^3 - 6t^2$ find the inst. acceleration at $t=4$ $v'(t) = 3t^2 - 12t$ $v'(4) = a(4) = 3(4)^2 - 12(4) = 0$
Given a table of values for velocity, how can you approximate the instantaneous acceleration at a point?	find the average acceleration with a small interval around the specified point

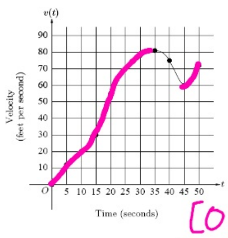
t	$v(t)$
0	5
6	10
10	15
12	30

approximate the inst. acceleration at $t=6$

$$\frac{15-5}{10-0}=1$$

$$\frac{15-10}{10-6}=\frac{5}{4}$$

$$\frac{10-5}{6-0}=\frac{5}{6}$$



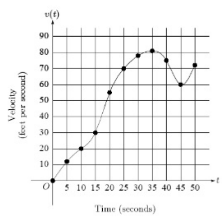
t (seconds)	$v(t)$ (feet per second)
0	0
5	12
10	20
15	30
20	55
25	70
30	78
35	81
40	75
45	60
50	72

$0 \le t \le 35$

$[0,35]$ $[45,50]$

3. The graph of the velocity $v(t)$, in ft/sec, of a car traveling on a straight road, for $0 \le t \le 50$, is shown above. A table of values for $v(t)$, at 5 second intervals of time t, is shown to the right of the graph.

(a) During what intervals of time is the acceleration of the car positive? Give a reason for your answer.

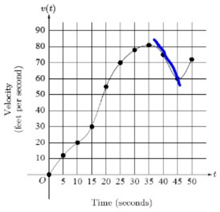


t (seconds)	$v(t)$ (feet per second)
0	0
5	12
10	20
15	30
20	55
25	70
30	78
35	81
40	75
45	60
50	72

3. The graph of the velocity $v(t)$, in ft/sec, of a car traveling on a straight road, for $0 \le t \le 50$, is shown above. A table of values for $v(t)$, at 5 second intervals of time t, is shown to the right of the graph.

(b) Find the average acceleration of the car, in ft/sec^2, over the interval $0 \le t \le 50$.

$$\frac{72-0}{50-0}=\frac{72}{50}$$



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0	0
5	12
10	20
15	30
20	55
25	70
30	78
35	81
40	75
45	60
50	72

3. The graph of the velocity $v(t)$, in ft/sec, of a car traveling on a straight road, for $0 \le t \le 50$, is shown above. A table of values for $v(t)$, at 5 second intervals of time t, is shown to the right of the graph.

(c) Find one approximation for the acceleration of the car, in ft/sec^2, at $t = 40$. Show the computations you used to arrive at your answer.

(c) Difference quotient; e.g.

$$\frac{v(45)-v(40)}{5} = \frac{60-75}{5} = -3 \text{ ft/sec}^2 \quad \text{or}$$

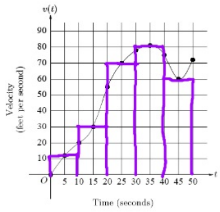
$$\frac{v(40)-v(35)}{5} = \frac{75-81}{5} = -\frac{6}{5} \text{ ft/sec}^2 \quad \text{or}$$

$$\frac{v(45)-v(35)}{10} = \frac{60-81}{10} = -\frac{21}{10} \text{ ft/sec}^2$$

–or–

Slope of tangent line, e.g.

through $(35, 90)$ and $(40, 75)$: $\dfrac{90-75}{35-40} = -3 \text{ ft/sec}^2$



t (seconds)	$v(t)$ (feet per second)
0	0
5	12
10	20
15	30
20	55
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35	81
40	75
45	60
50	72

3. The graph of the velocity $v(t)$, in ft/sec, of a car traveling on a straight road, for $0 \le t \le 50$, is shown above. A table of values for $v(t)$, at 5 second intervals of time t, is shown to the right of the graph.

$10(12+30+70+81+60)$

(d) using the midpoints of five subintervals of equal length. Using correct units, explain the meaning of this integral.

$= 2530$ ft

distance traveled from 0 to 50 seconds