Good afternoon:
We will have a mini-lesson on using the IVT shortly, have notes out

Assessments are being passed back, look over them with partners, ask questions and learn :)

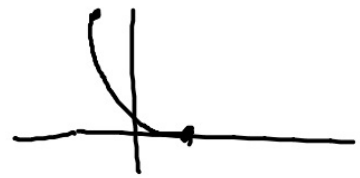
Using the IVT

Find the value(s) of c in [-2,3] guaranteed to exist by the IVT such that f(c)=2 for $f(x)=x^2-5x+6$

$f(x)$ is cont. b/c polynomial $\Rightarrow$ IVT applies.

$f(-2) = (-2)^2 - 5(-2) + 6 = 20$

$f(3) = 3^2 - 5(3) + 6 = 0$



Since $20 \geq 2 \geq 0$, some $c \in [-2,3]$ exists.

$$f(c) = 2 = c^2 - 5c + 6$$

$$\quad -2 \qquad\qquad\quad -2$$

$$0 = c^2 - 5c + 4$$

$$0 = (c-4)(c-1)$$

$\cancel{c=4}$ $\qquad$ $c=1$

not in $[-2,3]$

Find the value(s) of c in [0,7] guaranteed to exist by the IVT such that f(c)=28 for f(x)=x^2+6x+1

$f(0) = 1$

$f(7) = 92$

$92 > 28 > 1$

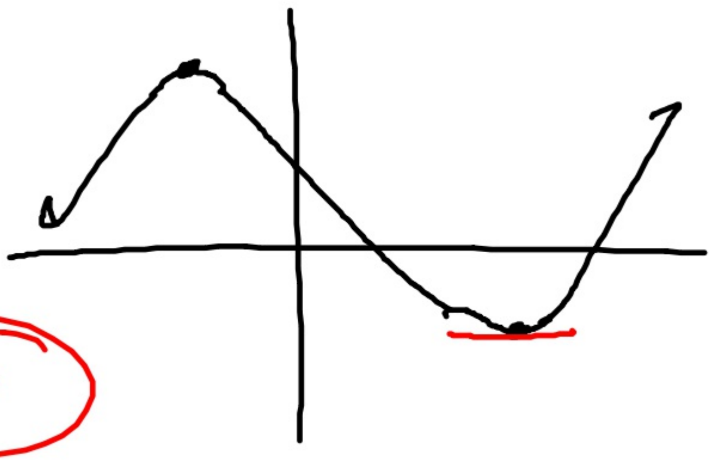
$f(c) = c^2 + 6c + 1 = 28$

$c^2 + 6c - 27 = 0$

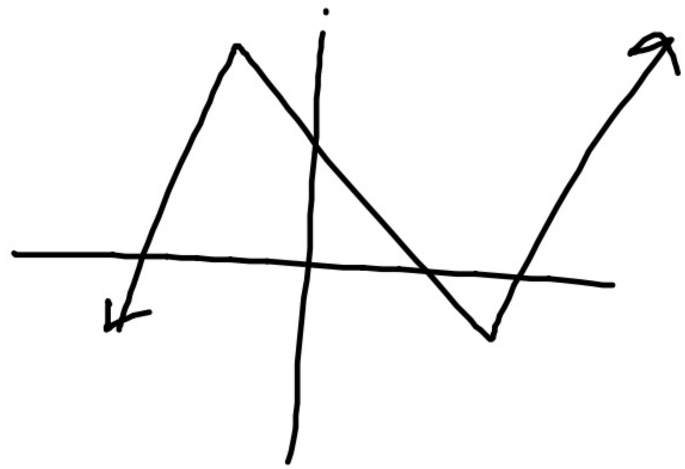
$(c+9)(c-3) = 0$

$\cancel{c = -9}$ $c = 3$

IVT AP Practice



E

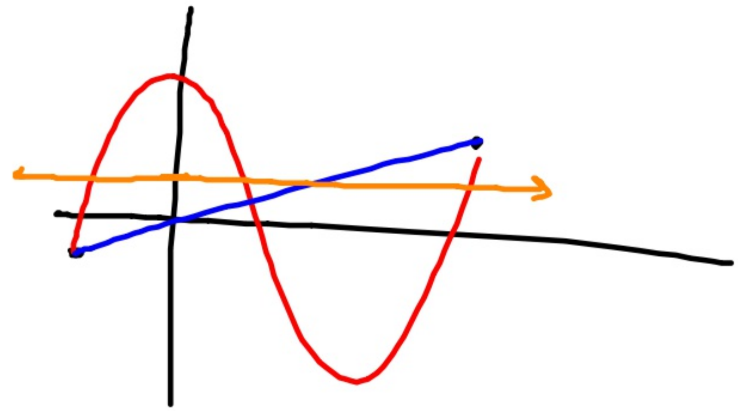


Good afternoon: warm up, do #1,3-5 on the handout from DS

You will need a device today
(can use computers in back if needed)

1.

Let f be a continuous function on the closed interval $[-3,6]$. If $f(-3)=-1$ and $f(6)=3$, then the Intermediate Value Theorem guarantees that



(A) $f(0)=0$

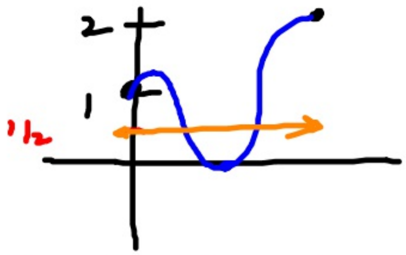
(B) $f'(c)=\frac{4}{9}$ for at least one c between -3 and 6

~~(C)~~ $-1 \le f(x) \le 3$ for all x between -3 and 6

(D) $f(c)=1$ for at least one c between -3 and 6

(E) $f(c)=0$ for at least one c between -1 and 3

3.



x	0	1	2
$f(x)$	1	k	2

The function f is continuous on the closed interval $[0,2]$ and has values that are given in the table above. The equation $f(x)=\frac{1}{2}$ must have at least two solutions in the interval $[0,2]$ if $k=$

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) 2 (E) 3

4.

Let g be a continuous function on the closed interval $[0,1]$. Let $g(0)=1$ and $g(1)=0$. Which of the following is NOT necessarily true?

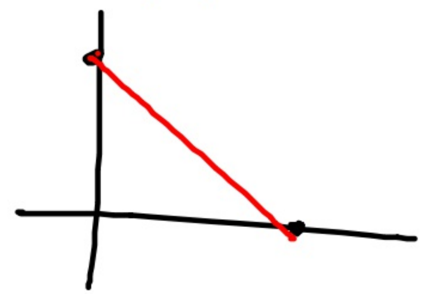
(A) There exists a number h in $[0,1]$ such that $g(h) \geq g(x)$ for all x in $[0,1]$.

(B) For all a and b in $[0,1]$, if $a=b$, then $g(a)=g(b)$.

(C) There exists a number h in $[0,1]$ such that $g(h)=\frac{1}{2}$.

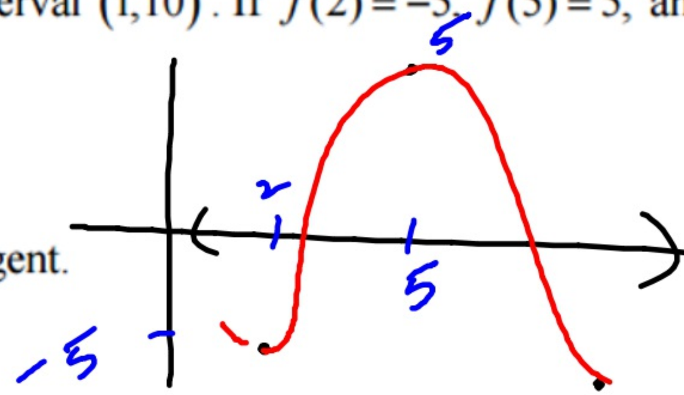
(D) There exists a number h in $[0,1]$ such that $g(h)=\frac{3}{2}$.

(E) For all h in the open interval $(0,1)$, $\lim_{x \to h} g(x) = g(h)$.



5.

Let f be a function that is differentiable on the open interval $(1,10)$. If $f(2)=-5$, $f(5)=5$, and $f(9)=-5$, which of the following must be true?



I. f has at least 2 zeros.

II. The graph of f has at least one horizontal tangent.

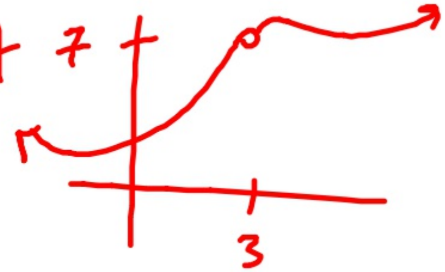
III. For some c, $2<c<5$, $f(c)=3$.

(A) None
(B) I only
(C) I and II only
(D) I and III only
(E) I, II, and III

Pass eggs to person nearest to the door
Get out limits packet, submit answers at

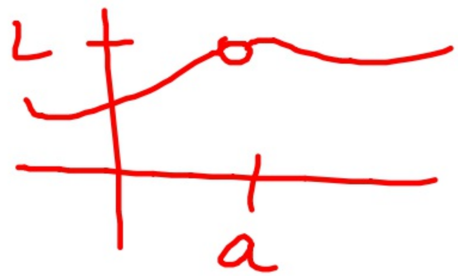
bit.ly/limitspack

#7



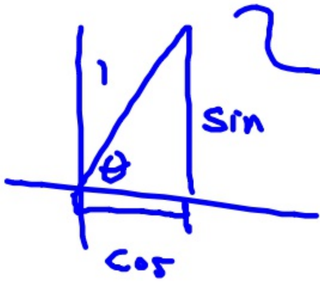
#3.) $\lim_{x \to a} f(x) = L$

E



(11) $$\lim_{x\to 0} \frac{1-\cos x}{2\boxed{\sin^2 x}} \qquad \frac{1-\cos x}{2(1-\cos^2 x)} \qquad \frac{\cancel{1-\cos x}}{2(1+\cos x)\cancel{(1-\cos x)}}$$

$$\Rightarrow \sin^2 x + \cos^2 x = 1$$



$$\sin^2 = 1 - \cos^2$$

$$\lim_{x\to 0} \frac{1}{2(1+\cos x)}$$

$$\frac{1}{2\underbrace{\cancel{(1+1)}}_{2}} = \frac{1}{4}$$

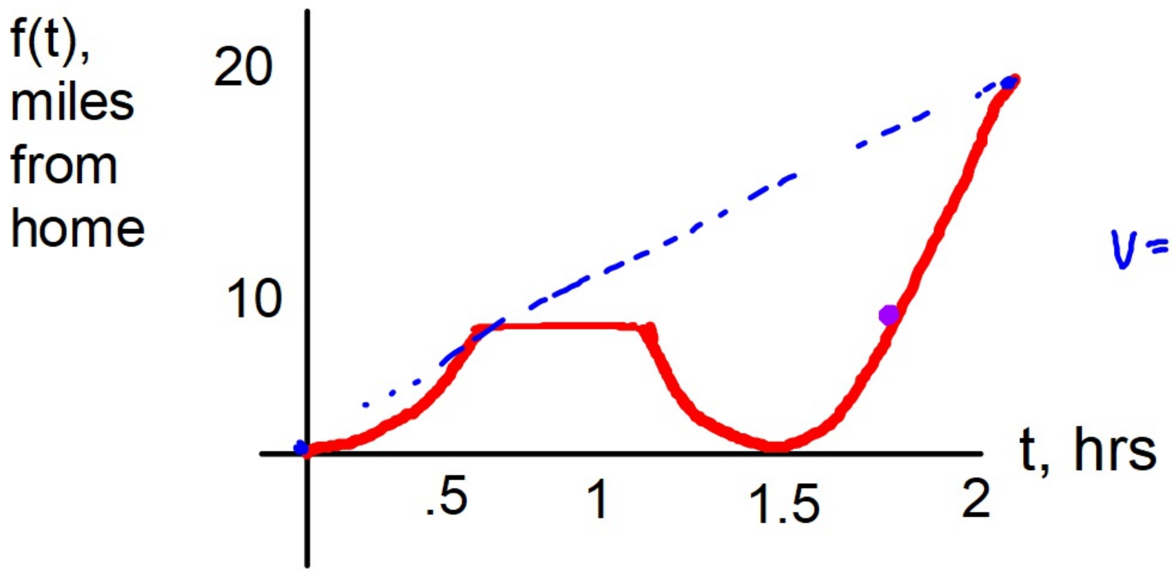
(18)

$$f(x) = \begin{cases} \dfrac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \neq 2 \\ K, & x = 2 \end{cases}$$

$$\lim_{x \to 2} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} \cdot \frac{\sqrt{2x+5} + \sqrt{x+7}}{\text{"} \qquad \text{"}}$$

$$\frac{2x+5-(x+7)}{(x-2)(\sqrt{2x+5}+\sqrt{x+7})} \Rightarrow \frac{2x+5-x-7}{(x-2)(\sqrt{2x+5}+\sqrt{x+7})}$$

Beginning the Derivative



Average velocity?

over these 2 hrs.

$$v = \frac{\Delta s}{\Delta t} = \frac{20 \text{ miles}}{2 \text{ hrs}}$$

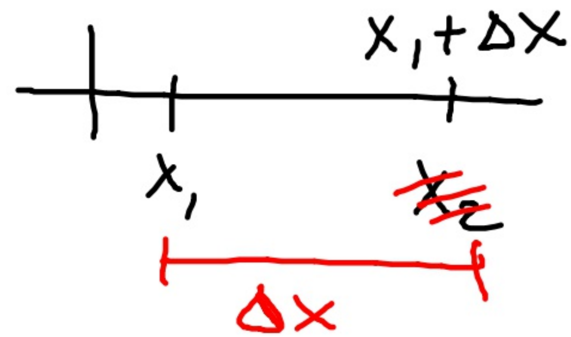
10 mph.

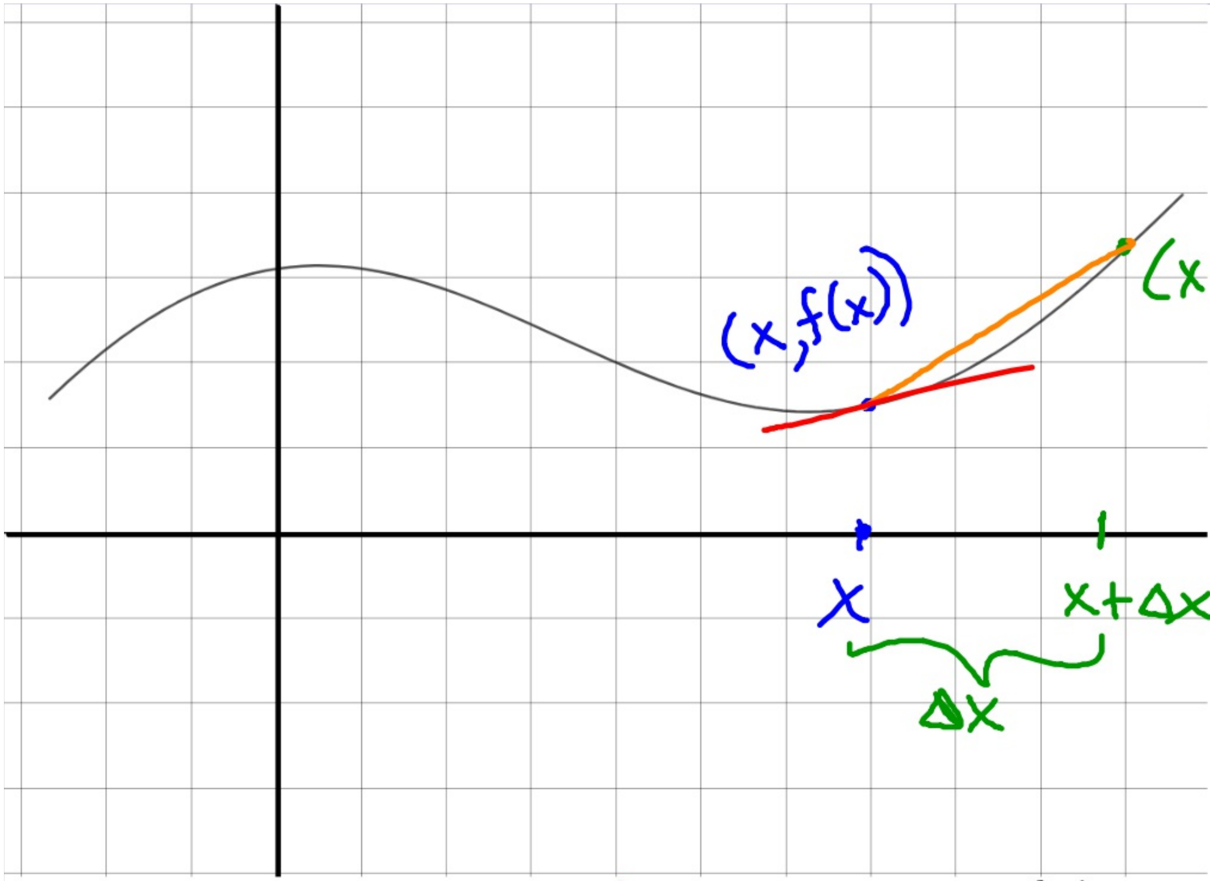
Slope Formula Through the Ages

Algebra I $$\frac{y_2 - y_1}{x_2 - x_1}$$

Function Notation $$\frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

"Difference Quotient" $$\frac{f(x + \Delta x) - f(x)}{\Delta x}$$





Slope of secant:

$$\frac{f(x+\Delta x) - f(x)}{\cancel{x} + \Delta x - \cancel{x}}$$

$$\frac{f(x+\Delta x) - f(x)}{\Delta x}$$

Derivative = slope of tangent line $\Rightarrow$ $\displaystyle\lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$

Limit definition of derivative

ADD TO BOOKLETS

The slope of a line tangent to a function f at (x, f(x)) is given by

$$\underbrace{f'(x)}_{\text{"f prime of x"}} = \underbrace{\frac{df}{dx}} = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

What *is* a derivative?

- Slope of the line tangent to a curve
- Instantaneous rate of change (vs. average rate of change)
- "Velocity" (as opposed to position)
- limit of the difference quotient
- slope at 1 point
- 'curviness' of a function at one point

and much much more!!!