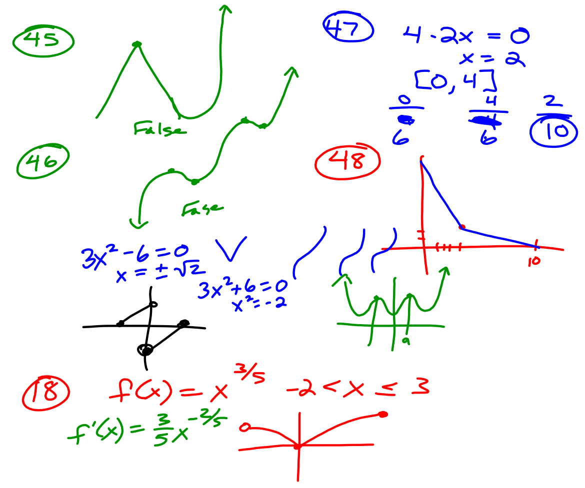

Nov 4-11:00 AM

4-2 Mean Value Theorem

Learning Objectives:

I can apply the Mean Value Theorem to find a location for which the instantaneous slope equals the average slope.

I can identify when a function is increasing and when it is decreasing and I understanding the relationship between this and the derivative of the function.

I can find the antiderivative of a function.

Oct 16-11:24 AM

3) Let f(x) = 4-3x. Which of the following is equal to f'(-1)?

a) -7 b) 7 c) -3 d) 3 e) does not exist

4) Let f(x) = 1-3x². Which of the following is equal to f'(1)?

a) -6 b) -5 c) 5 d) 6 e) does not exist

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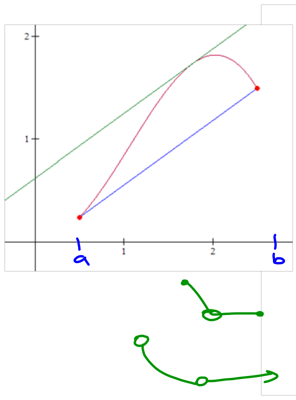


Mean Value Theorem (Part 1)

If y = f(x) is connuous at every point in the closed interval [a,b] and differenable at every point in the open interval (a,b), then there is at least one point c in (a,b) such that

$$f'(c)=\frac{f(b)-f(a)}{b-a}$$

Oct 16-11:24 AM

Ex1. Show that each function satisfies the hypotheses of the Mean Value Theorem on the given interval. Then find a solution "c" to the equation $f'(c)=\frac{f(b)-f(a)}{b-a}$

1.) $f(x)=3x^2+2x+5$ on [-1,3]

6c + 2 = 8

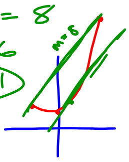
6c = 6

c = 1

(-1, 6)

(3, 38)

$\frac{38-6}{3--1} = \frac{32}{4} = 8$



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2.) $f(x)=\sin(2x)$ on $\left[0,\frac{\pi}{4}\right]$

(0, 0)

(π/4, 1)

$\frac{1-0}{\frac{\pi}{4}-0} = \frac{4}{\pi}$

$2\cos(2c) = \frac{4}{\pi}$

$\cos(2c) = \frac{2}{\pi}$

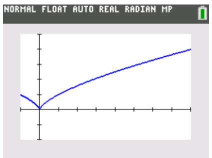
$2c = \cos^{-1}\left(\frac{2}{\pi}\right)$

c = .440

Oct 16-11:24 AM

3.) $f(x) = x^{2/3}$ on [-1,8]

cont.
closed int.
not diff at $x=0$



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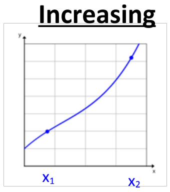
Increasing & Decreasing Functions

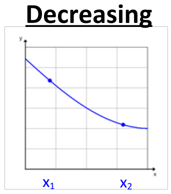
Increasing



f is increasing if $x_1<x_2$ and $f(x_1)<f(x_2)$

If $f'(x)>0$ at each point in (a,b), then f increases on (a,b)

Decreasing



f is decreasing if $x_1<x_2$ and $f(x_1)>f(x_2)$

If $f'(x)<0$ at each point in (a,b), then f decreases on (a,b)

Oct 16-11:24 AM

Ex3. Find all possible functions with the given derivative

1.) $f'(x) = 6x^2 + 2x + 3$

$f(x) = 2x^3 + x^2 + 3x + C$

2.) $g'(x) = \sec^2 x$

$g(x) = \tan x + C$

Oct 16-11:24 AM

Ex4. Find the function with the given derivative that passes through the given point

1.) $y' = 3e^{3x}$ (0,4)

$y = e^{3x} + c$

$4 = e^0 + c$

$4 = 1 + c$

$3 = c$

$y = e^{3x} + 3$

2.) $h'(x) = 2x+5$ (2,7)

$h(x) = x^2 + 5x + c$

$7 = 4 + 10 + c$

$c = -7$

Oct 16-11:24 AM

Homework

pg 202 # 1-4, 7, 9-14, 29-38, 43-45, 51-56

Oct 16-11:24 AM