

Handwritten notes and graphs:

- (45) *False* (with a graph of a function that is not differentiable at a peak)
- (46) *False* (with a graph of a function that is not differentiable at a sharp corner)
- (47) $4 - 2x = 0$
 $6 \neq 0$ $[0, 4]$ $x = 2$ $\frac{10}{2} = 5$
- (48) (with a graph of a function on a coordinate plane)
- (18) $f(x) = x^{3/5}$ $-2 < x \leq 3$
 $f'(x) = \frac{3}{5}x^{-2/5}$ (with a graph of the function and its derivative)

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 understand the relationship between this and the derivative of the function.

I can find the antiderivative of a function.

Oct 16-11:24 AM

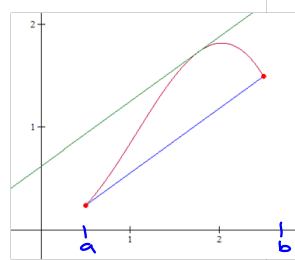
3) Let $f(x) = 4 - 3x$. Which of the following is equal to $f'(-1)$?

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

4) Let $f(x) = 1 - 3x^2$. Which of the following is equal to $f'(1)$?

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

Oct 21-12:55 PM



Mean Value Theorem (Part 1)

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

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

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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 $[-1, 3]$

Handwritten work for problem 1:

- $6c + 2 = 8$
- $6c = 6$
- $c = 1$ (circled)
- Graph of the parabola $f(x) = 3x^2 + 2x + 5$ on the interval $[-1, 3]$ with a secant line and a tangent line at $c = 1$.
- Calculation: $\frac{38 - 6}{3 - (-1)} = \frac{32}{4} = 8$

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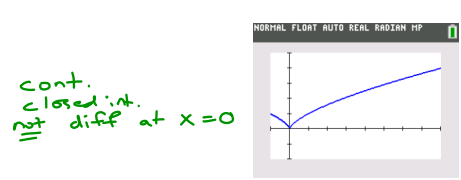
2.) $f(x) = \sin(2x)$ on $[0, \frac{\pi}{4}]$

Handwritten work for problem 2:

- Points: $(0, 0)$ and $(\frac{\pi}{4}, 1)$
- Equation: $2 \cos(2c) = \frac{4}{\pi}$
- Equation: $\cos(2c) = \frac{2}{\pi}$
- Equation: $2c = \cos^{-1}(\frac{2}{\pi})$
- Equation: $c = .440$
- Calculation: $\frac{1 - 0}{\frac{\pi}{4} - 0} = \frac{4}{\pi}$

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

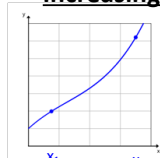


Cont.
closed int.
not diff at $x=0$


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Increasing & Decreasing Functions

Increasing



Decreasing



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)

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)

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

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

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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)

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

$$7 = 4 + 10 + C$$

$$C = -7$$

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Homework

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

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