

## UNIT 2 GUIDE

**Note:** Video titles are clickable links.

### Readings Day 7

- (1) Read in OpenStax: The subsections of Section 3.2 titled " Graphing a Derivative" and "Derivatives and Continuity" through Example 3.14
  - (a) Theorem 3.1 - Differentiability Implies Continuity
- (2) Read in OpenStax: Section 4.3
  - (a) Definition of Absolute Maximum and Minimum
  - (b) Theorem 4.1 - Extreme Value Theorem
  - (c) Definition of Local Maximum and Minimum
  - (d) Definition of Critical Point
  - (e) Theorem 4.2 - Fermat's Theorem
  - (f) Theorem 4.3 - Location of Absolute Extrema
- (3) Read in OpenStax: The subsections of Section 4.5 titled "The First Derivative Test" and "Concavity and Points of Inflection" through Figure 4.37
  - (a) Theorem 4.9 - First Derivative Test
  - (b) Definition of Concave Up and Down
  - (c) Theorem 4.10 - Test for Concavity
  - (d) Definition - Inflection Point

### Videos Day 7

- (1) [Local Extrema and Critical Points](#)
- (2) [First Derivative and Graph Shape](#)
- (3) [Absolute Extrema](#)
- (4) [Concavity and Inflection Points](#)

**Pre-Class Quiz 7**

- (1) True or False: A point  $x = c$  in the domain of a function  $f(x)$  is a local maximum location if all other values of  $f(x)$  near  $x = c$  are less than or equal to  $f(c)$ .
- ☐ (a) True
- ☐ (b) False
- (2) A point  $x = c$  in the domain of a function  $f(x)$  is a local minimum location if  $f(x) \leq f(c)$  for all other values of  $f(x)$  near  $x = c$ .
- ☐ (a) True
- ☐ (b) False
- (3) What topics from the Pre-Class materials, reading(s) and video(s), do you still have questions about. **Select ALL that apply.**
- ☐ (a) When a function has a local maximum or minimum
- ☐ (b) What it means for a function to be increasing/decreasing
- ☐ (c) What a critical point is
- ☐ (d) I have no questions at this time

**Readings Day 8**

nothing

**Videos Day 8**

nothing

**Pre-Class Quiz 8**

- (1) All functions have at least one critical point.
- ☐ (a) True
- ☐ (b) False
- (2) Look at the graph of the function  $y = x^3$ . How many times does this function change concavity?

- ☐ (a) No times
  - ☐ (b) One time
  - ☐ (c) Two times
  - ☐ (d) Three times
- (3) What topics from the Pre-Class materials, reading(s) and video(s), do you still have questions about. **Select ALL that apply.**
- ☐ (a) The extreme value theorem
  - ☐ (b) What concavity is
  - ☐ (c) What first and second derivatives tell us about graphs
  - ☐ (d) I have no questions at this time

### Readings Day 9

- (1) Monday will be a catch-up and review day for the Unit 1 Quiz. You should review the Unit 1 - Study Guide before class on Monday.

### Videos Day 9

nothing

### Pre-Class Quiz 9

- (1) What Unit 1 topics do you still have questions about? **Select ALL that apply.**
- ☐ (a) Limits from Graphs
  - ☐ (b) The Definition of a Limit
  - ☐ (c) The Derivative Power Rule
  - ☐ (d) The Derivative Sum, Difference, and Constant
  - ☐ (e) Multiple Rules
  - ☐ (f) Continuity
  - ☐ (g) Finding the Slope of a Tangent Line

- ☐ (h) Finding the Equation of a Target Line
- ☐ (i) Interpreting the output of a Derivative
- ☐ (j) I don't have any questions right now

### Readings Day 10

- (1) Read in OpenStax: The subsection of Section 3.2 titled "Derivatives and Continuity" through example 3.14
  - (a) Theorem 3.1 - Differentiability Implies Continuity
- (2) Read in OpenStax: Section 4.3 (You have read through this before)
  - (a) Definition of Absolute Maximum and Minimum
  - (b) Theorem 4.1 - Extreme Value Theorem
  - (c) Definition of Local Maximum and Minimum
  - (d) Definition of Critical Point
  - (e) Theorem 4.2 - Fermat's Theorem
  - (f) Theorem 4.3 - Location of Absolute Extrema
- (3) Read in OpenStax: The subsection of Section 4.4 titled "The Mean Value Theorem and Its Meaning" through example 4.16 (You have read much of this subsection before, so pay close attention to the two examples.)
- (4) Read in OpenStax: Section 4.5 (You have read much of this section before, so pay close attention to the subsection titled "The Second Derivative Test".)
  - (a) Theorem 4.9 - First Derivative Test
  - (b) Definition of Concave Up and Down
  - (c) Theorem 4.10 - Test for Concavity
  - (d) Definition - Inflection Point
  - (e) Theorem 4.11 - Second Derivative Test

### Videos Day 10

- (1) [First Derivative Test](#)
- (2) [Second Derivative Test](#)
- (3) [All about a polynomial](#)

### Pre-Class Quiz 10

- (1) Approximate the solution(s) to  $g(x) = 1$ , if  $g(x) = \frac{3}{2}x^2 - 6x + 5$ .
- ☐ (a)  $x = 0$  or  $5$
  - ☐ (b)  $x \approx 0.845$  or  $3.155$
  - ☐ (c)  $x \approx 1.184$  or  $2.816$
  - ☐ (d)  $x = 2$
- (2) Approximate the solution(s) to  $g(x) = 0$ , if  $g(x) = \frac{3}{2}x^2 - 6x + 5$ .
- ☐ (a)  $x = 0$  or  $5$
  - ☐ (b)  $x \approx 0.845$  or  $3.155$
  - ☐ (c)  $x \approx 1.184$  or  $2.816$
  - ☐ (d)  $x = 2$
- (3) Approximate the solution(s) to  $g(x) > 0$ , if  $g(x) = \frac{3}{2}x^2 - 6x + 5$ .
- ☐ (a)  $(2, \infty)$
  - ☐ (b)  $(-\infty, 1.184) \cup (2.816, \infty)$
  - ☐ (c)  $(2.816, \infty)$
  - ☐ (d)  $(1.184, 2.816)$
- (4) What topics from the Pre-Class materials, reading(s) and video(s), do you still have questions about. **Select ALL that apply.**
- ☐ (a) The First Derivative Test
  - ☐ (b) The Second Derivative Test

- ☐ (c) The Extreme Value Theorem
- ☐ (d) The Mean Value Theorem
- ☐ (e) I have no questions at this time

### Readings Day 11

- (1) Same as Day 10

### Videos Day 11

nothing

### Pre-Class Quiz 11

- (1) Determine the critical points of the function:  $h(x) = x^3 - 9x^2 + 24x + 5$

The critical points are [input1] and [input2]

- (2) Find the  $(x, y)$ -ordered pair for the absolute minimum and maximum of the function  $g(x) = \frac{3}{2}x^2 - 6x + 5$  on the interval  $[0, 3]$ .

The  $(x, y)$ -ordered pair for the absolute minimum is [minimum]

The  $(x, y)$ -ordered pair for the absolute maximum is [maximum]

- (3) True or False: The derivative of the function  $P(V) = \frac{500}{V}$  is  $P'(V) = \frac{500}{V^2}$

- (4) Find the derivative of the function  $M(v) = (v + 5)(v - 6)$

- (5) What topics from the Pre-Class materials, reading(s) and video(s), do you still have questions about. **Select ALL that apply.**

- ☐ (a) The First Derivative Test
- ☐ (b) The Second Derivative Test
- ☐ (c) The Extreme Value Theorem
- ☐ (d) The Mean Value Theorem
- ☐ (e) I have no questions at this time

## Readings Day 12

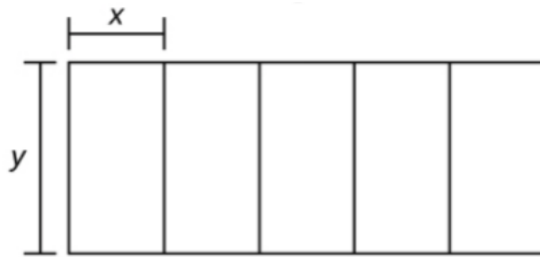
- (1) Read in OpenStax: Section 4.7

## Videos Day 12

- (1) [Optimization 1](#)  
 (2) [Optimization 2](#)  
 (3) [All about a polynomial](#)

## Pre-Class Quiz 12

- (1) You are building five identical pens adjacent to each other with a total area of  $1000 \text{ m}^2$ , as shown in the following figure. What is an equation that involves  $x$  and  $y$  that describes the total area of the pens?



- (2) You are building five identical pens adjacent to each other with a total area of  $1000 \text{ m}^2$ , as shown in the following figure. What is an equation that involves  $x$  and  $y$  that represents the total amount of fencing needed to build the pens?



## Readings Day 13

- (1) Wednesday will be continuation of Monday's material, so there is no pre-class reading for Wednesday.

## Videos Day 13

nothing

## Pre-Class Quiz 13

- (1) An open-top box is to be made from a 30-inch by 48-inch piece of plastic by removing a square (with side lengths  $x$ ) from each corner of the plastic and folding up the flaps on each side. What are the possible values for  $x$ ? That is, what values make sense in the context of the situation?
- (2) Which test or theorem can we use to help us determine if a critical point is a local maxima or local minima? **Select all that apply.**
- ☐ (a) Mean Value Theorem
  - ☐ (b) First derivative test
  - ☐ (c) Second derivative test
  - ☐ (d) Extreme value theorem
- (3) What questions do you still have about optimization problems (extreme value word problems)?