UNIT 1 GUIDE

Note: Video titles are clickable links.

Readings Day 1

(1) Read in OpenStax: The subsection in section 1.2 titled "Linear Functions and Slope" through example 1.12.

   (a) Definition of slope

   (b) Definitions for point-slope equation and slope-intercept form for lines

(2) Read in OpenStax: The subsection in section 1.2 "Polynomials" through example 1.14.

   (a) Rule: The Quadratic Formula

Videos Day 1

(1) Secant Lines
(2) Root of Polynomials

Pre-Class Quiz 1

(1) Do you have reliable access to the internet where you live?

   ◯ (a) yes

   ◯ (b) no

   If not, do you have reliable internet elsewhere (coffee shop, library, etc.)?

   ◯ (a) yes

   ◯ (b) no

   If not, do you have intermittent/limited access to the internet?

   ◯ (a) yes

   ◯ (b) no

(2) How do you typically access Canvas and Zoom?

◯ (a) PC

◯ (b) Mac

(3) How familiar are you with Canvas functions?

◯ (a) Extremely

◯ (b) Fairly

◯ (c) A little bit

◯ (d) Not at all

(4) We will be engaging in small group work throughout the term. In order to make this work productive and enjoyable please think about and answer this question:
What behavior(s) from your fellow group members make group work most productive and enjoyable?
Please bring these ideas to the first day of class. We may ask you to share ideas if you are comfortable.

(5) If we are given the height above the ground, h(t), of an object at time t how do we find when the object hits the ground?

(6) Find the roots of the following polynomials:

(a) $\boldsymbol{f(x) = (x-1)(x-3)(x+2)}$

Roots of $\boldsymbol{f(x)}$:

Find the solution(s) to the following:

(b) $\boldsymbol{0 = x^2 - x - 2}$

Solution(s):

Readings Day 2

(1) Read in OpenStax: Parts of Section 2.1 (From beginning through the Definition for Instantaneous Velocity)

(a) Definition: Secant Lines

(b) Definition: Tangent Lines

(c) Definition: Average Velocity (Average Rate of Change)

(d) Definition: Instantaneous Velocity (Instantaneous Rate of Change)

(2) Read in OpenStax: Parts of Section 3.1 (From beginning through Example 3.3) and (The subsection "Velocities and Rates of Change" up to Example 3.8)

(a) Definition (3.1 and 3.2): Difference Quotient

(b) Definition (3.3 and 3.4): Tangent Line Slopes

(c) Definition: Instantaneous Rate of Change

(3) Read in OpenStax: Parts of Section 3.4 (Subsection "Motion along a Line")

(a) Just read the definition box for position, velocity, speed, and acceleration.

(4) Read in OpenStax: Parts of Section 4.4 (Subsection "The Mean Value Theorem and Its Meaning" up to example 4.15)

(a) Theorem 4.5: Mean Value Theorem

Videos Day 2

(1) Tangent Lines
Desmos Link
(2) Definition of Derivative
(3) Mean Value Theorem
Desmos Link

Pre-Class Quiz 2

(1) Given the height, in meters, of an object above the ground, $h(t)$ for $t \geq 0$ (seconds), what are the units of the average rate of change of the object on the interval $[0, a]$. (Assume the ball has not hit the ground before time a.)

◯ (a) seconds

◯ (b) meters

◯ (c) seconds per meter

◯ (d) meters per second

(2) Assume the temperature of a hot cup of coffee that is cooling in a room is given by, $T(t)$ for $t \geq 0$ (T has units degrees Celsius and t has units minutes), what are the units of the average rate of change of the temperature of the coffee?

◯ (a) minutes per degree Celsius

◯ (b) degrees Celsius per minute

◯ (c) minutes

◯ (d) degrees Celsius

(3) Assume the temperature of a hot cup of coffee that is cooling in a room is given by, $T(t)T$ for $t \geq 0$ (T has units degrees Celsius and t has units minutes). Is the average rate of change of the temperature of the coffee positive, negative, or zero?

◯ (a) positive

◯ (b) negative

◯ (c) zero

(4) What topics from the Pre-Class materials, reading(s) and video(s), do you still have questions about.

◯ (a) Average Rate of Change Units

◯ (b) Finding the Equation of a Line

◯ (c) Mean Value Theorem

◯ (d) The Tangent Line

◯ (e) No Questions Right Now

Readings Day 3

(1) Read in OpenStax: Section 2.2

   (a) Definition of the limit of f(x)

   (b) Limits from tables and graphs

   (c) Theorem 2.1

   (d) Definition of one-sided limits

   (e) Definition of infinite limits

Videos Day 3

(1) Definition of a Limit
(2) One-sided limits
(3) Infinite Limits

Pre-Class Quiz 3

(1) In the following sentence, fill in the blanks to write the limit, $\lim_{x\to -2} h(x) = 5$, as a sentence:
The limit as [blank1] goes to [blank2] of the function [blank3] is [blank4].

(2) If we write $\lim_{x\to a} f(x) = \infty$ does the limit as x approaches a of $f(x)$ exist?

   (a) yes

   (b) no

(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 Definition of a Limit

   (b) Limits from Graphs

   (c) Limits from Tables

   (d) One-Sided Limits

   (e) Infinite Limits

(f) I have no questions right now

Readings Day 4

(1) Read in OpenStax: The subsections of Section 2.3 titled "Evaluating Limits with the Limit Laws" and "Limits of Polynomial and Rational Functions" through Example 2.16

(a) Theorem 2.4

(b) Theorem 2.5

(c) Theorem 2.6

(2) Read in OpenStax: The subsection in Section 2.4 titled "Continuity at a point" through Example 2.28.

(a) Definition of continuous at a point

(b) Problem-Solving Strategy: Determining Continuity at a Point

Videos Day 4

(1) Limit Laws
(2) Continuity
(3) Infinite Limits

Pre-Class Quiz 4

(1) Determine the following limit:

$$\lim_{x\to -1}(9x+1)^2$$

(2) Determine the following limit:

$$\lim_{x\to 6}\frac{3x-18}{2x-12}$$

(3) What are some of the ways we can "see" discontinuities in a graph of a function?

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

◯ (a) Limit Laws

◯ (b) What makes a function continuous

◯ (c) Where a functions has discontinuities

◯ (d) I have no questions right now

Readings Day 5

(1) Read in OpenStax: The subsections of Section 3.3 titled "The Basic Rules", "The Power Rule", and " The Sum, Difference, and Constant Multiple Rules" through Example 3.14

(a) Theorem 3.2: The Constant Rule

(b) Theorem 3.3: The Power Rule

(c) Theorem 3.4: Sum, Difference, and Constant Multiple Rules

Videos Day 5

(1) The Constant Rule
(2) The Power Rule
(3) The Sum, Difference, and Constant Multiple Rule

Pre-Class Quiz 5

(1) Find the derivative, $f'(x)$, of the function $f(x) = x^2 - x - 1$.

◯ (a) 2x - 1

◯ (b) x - 1

◯ (c) 2x

◯ (d) -1

(2) True or False: $\frac{d}{dt}\left[t^4 + \sqrt{t} - t^2\right] = 4t^3 + \frac{1}{2\sqrt{t}} - 2t$

◯ (a) True

◯ (b) False

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

◯ (a) True

◯ (b) False

(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) Power rule with positive exponents

◯ (b) Power rule with fraction exponents

◯ (c) Power rule with negative exponents

◯ (d) I have no questions right now

Readings Day 6

(1) Read in OpenStax: In Section 3.3, Example 3.22 and try Checkpoint 3.15
(2) Read in OpenStax: The subsection of Section 4.2 titled "Linear Approximation of a Function at a Point" through Example 4.5

Videos Day 6

(1) Tangent Lines
(2) Linear Approximations
(3) The Sum, Difference, and Constant Multiple Rule

Pre-Class Quiz 6

(1) Given $f(x) = 3x^2 - 2x + 6$, find the tangent line to $f(x)$ at the point (1, 7) in slope-intercept form. Fill in the blanks for the slope and the y-intercept.
y = [slope]x + [yintercept]

(2) Consider a function $g(x)$. The tangent line to $g(x)$ at x = 2 in point-slope form is:

$$y - 14 = 16(x - 2)$$

Use the tangent line to predict $g(3)$.

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

◯ (a) What a tangent line is

◯ (b) How to find linear approximations

◯ (c) Why we use tangent lines to approximate functions

◯ (d) I have no questions at this time