

CALCULUS 12 LG 5/6

DERIVATIVE



INTRODUCTION:

The derivative is one of the two major components to this calculus course. It is very important to understand the concepts brought up in this learning guide.



LEARNING GUIDE EXPECTATIONS:

On the completion of this learning guide you will be able to:

- 1) describe geometrically a secant line and a tangent line for the graph of a function at $x=a$.
- 2) distinguish between average and instantaneous rate of change.
- 3) define and calculate the derivative at $x=a$ using the definition of the derivative and other limit interpretations.
- 4) distinguish between continuity and differentiability of a function at a point.
- 5) determine the slope and equation of a tangent line to a curve at a point.
- 6) use the Sum, Product, Quotient and Power rule to calculate derivatives.
- 7) determine the derivative of elementary trig functions.
- 8) use the chain rule to compute the derivative of a composite function.
- 9) use the tangent line approximation to estimate values of a function near a point and analyze the approximation using the second derivative.



EVALUATION:

When you are ready, write the LG 5/6 quiz.



RESOURCES NEEDED:



Calculus 12 text.



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LEARNING ACTIVITIES



Expectation #1: Describe geometrically a secant line and a tangent line for the graph of a function at $x=a$.



Expectation #2: Distinguish between average and instantaneous rate of change.



1. [Watch and take notes on instructional video on Tangent Lines and Secant Lines.](#)



2. In Chapter 3.1, read pages 170-175.



3. In your journal explain using a graph, what the difference between the slope of a secant line and the slope of a tangent line. Show how they relate to the average and instantaneous velocity.



4. On pages 175-177, complete questions #1-9, 11, 19, 21.



Expectation #3 Define and calculate the derivative at $x=a$ using the definition of the derivative and other limit interpretations.



Expectation #4 Distinguish between continuity and differentiability of a function at a point.



Expectation #5 Determine the slope and equation of a tangent line to a curve at a point.



1. [Watch and take notes on instructional video on Introduction to the Derivative.](#)



2. [Watch and take notes on instructional video on Definition of the Derivative Examples.](#)



3. [Watch and take notes on instructional video on Differentiability.](#)



4. In Chapter 3.2, read pages 177-186.



5. In your journal:

- I. write down the definition of the derivative as given on the top of page 178.
- II. Describe what it means for a function to be differentiable. State, using examples, conditions where a function is not differentiable (points of non-differentiability).



6. On pages 186-189, complete questions #5, 9-19, 23, 25, 27a, 29, 35, 41-45.



Expectation #6 Use the Sum, Product, Quotient and Power rule to calculate derivatives.



1. [Watch and take notes on instructional video on Techniques of Differentiation.](#)



2. In Chapter 3.3, read pages 189-197.



3. In your journal, write down the following shortcut differentiation methods using an example to illustrate each one:

- I. Power rule (page 190)
- II. Product rule (page 192)
- III. Quotient rule (page 193)



4. On pages 197-199 complete questions #1-35, 41, 43-47odd, 59, 69, 75-79odd.



Expectation #7 Determine the derivative of elementary trig functions.



1. [Watch and take notes on instructional video on Derivatives of Trig Functions.](#)



2. In Chapter 3.4, read pages 200-202.



3. In your journal, write down the derivatives of the following functions.

- I. $y = \sin x$
- II. $y = \cos x$
- III. $y = \tan x$
- IV. $y = \csc x$
- V. $y = \sec x$
- VI. $y = \cot x$



4. On pages 202-203, complete questions #1-24, 27, 31, 32.



Expectation #8 Use the chain rule to compute the derivative of a composite function.



1. [Watch and take notes on instructional video on Chain Rule.](#)



2. In chapter 3.5, read pages 204-208.



3. In your journal, using an example, describe how you would use the chain rule to calculate a derivative.



4. On pages 208-210, complete #1-49, 55a, 61.



Expectation #9 Use the tangent line approximation to estimate values of a function near a point and analyze the approximation using the second derivative.



1. [Watch and take notes on instructional video on Local Linear Approximation.](#)



2. In chapter 3.6, read pages 210-216 with emphasis on the local linear approximation section from pages 212-214.



3. In your journal, using an example, describe how you can use the equation of the tangent line to estimate y -values of other functions.



4. On page 217, complete questions #17-20, 27-35.

Once you feel you are ready for the LG 5-6 quiz, complete the LG 5-6 Assessment Quiz on the website under "Assessment Quizzes" and then email your marked LG 5-6 quiz to your teacher along with any questions you may have. Please email your quiz as a pdf combined into 1 file and attach it to an email. You may email either version A or version B of the LG assessment quizzes.