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 in the test centre.

RESOURCES NEEDED:

Calculus 12 text.

www.thssmath.com

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.