

Business Calculus G/T Essential Curriculum

UNIT I: Functions and Change

Goal. The student will demonstrate the ability to use a problem solving approach to analyze functions. They will use recursive expressions, conduct investigations using technology, identify and discuss the relative behavior of functions, and develop mathematical models.

Objectives – The student will be able to:

- a. Model real world applications using functions and technology.
- b. Identify input/output variables (dependent/independent variables).
- c. Identify and describe relative behavior of linear, polynomial, exponential, logarithmic, and logistic functions.
- d. Identify and describe relative behavior of continuous versus discrete change models.
- e. Apply modeling to business applications, which may include present and future values, as well as exponential growth and decay.
- f. Identify and describe relative behavior of trigonometric functions.

UNIT II: Limits of Functions

Goal. The student will demonstrate the ability to use a problem solving approach to an estimate and determine the limit of a function.

Objectives – The student will be able to:

- a. Estimate limits of functions from graphs and tables of values.
- b. Explain concept of limits verbally and graphically in terms of continuous and discrete models, as well as in terms of secant and tangent lines.
- c. Determine limits using algebraic rules, such as replacement and cancellation rules.
- d. Determine limiting behavior at infinity.

UNIT III: Rates of Change (The Derivative Concept)

Goal. The student will demonstrate the ability to use a problem-solving approach, with technology, to study the mathematics of change. The student will use analytical, graphical, verbal, and numerical methods to study the derivative of a function as a rate of change.

Objectives – The student will be able to:

- a. Discuss the concept of average rates of change verbally and graphically.
- b. Discuss the concept of percentage change and percentage rate of change.
- c. Demonstrate average rates of change using the slope of secant lines.
- d. Use technology to demonstrate that the tangent line is the limit of the secant line as $x \rightarrow 0$.
- e. Use technology to demonstrate local linearity of a function and how this relates to the

- tangent line.
- f. Explain instantaneous rates of change at a point in terms of the tangent line and local linearity.
 - g. Estimate the instantaneous rate of change using the slope of the tangent line.
 - h. Define the derivative of a function as the limit of the difference quotient.
 - i. Explain the relationship between differentiability and continuity of functions and of points in terms of continuous and discrete models.
 - j. Estimate the graph of the instantaneous rate of change function (derivative) using the slope of the tangent line and derivative methods.

UNIT IV: Techniques of Differentiation

Goal. The student will demonstrate the ability to use a problem solving approach to apply rules of differentiation to a variety of functions.

Objectives – The student will be able to:

- a. Interpret the terminology and notations used to describe a derivative.
- b. Find the derivative of a function using the Power Rule, Sum/Difference Rule, Product Rule (Quotient Rule not found in the text is optional), and the Chain Rule.
- c. Find the derivative of exponential and logarithmic functions.
- d. Find the derivative of basic trigonometric functions.
- e. Perform implicit differentiation.

UNIT V: A Function's Relationship to its Derivative

Goal. The student will demonstrate the ability to use a problem solving approach to identify and analyze the relationship between a function and its derivative.

Objectives – The student will be able to:

- a. Identify points (and discuss their importance) that have horizontal and vertical tangents – critical points.
- b. Identify points (and discuss their importance) where concavity changes – inflection points.
- c. Identify intervals where a function is increasing or decreasing and discuss the associated real-world implications.

UNIT VI: Applications of the Derivative

Goal. The student will demonstrate the ability to use a problem solving approach to apply derivatives model, analyze, and solve real-world problems.

Objectives – The student will be able to:

- a. Solve optimization problems.
- b. Solve basic rate problems.
- c. Solve related rate problems.
- d. Solve additional problems in Science and Economics. Examples may include

Marginal Analysis, Elasticity of Demand, Average Cost, and Drug Concentration.

UNIT VII: Accumulation of Change (The Integral Concept)

Goal. The student will demonstrate the ability to use a problem solving approach to estimate and calculate the definite integral of a function, and to find the antiderivative of elementary functions.

Objectives – The student will be able to:

- a. Recognize in linear models that the area under the curve represents distance traveled and calculate the distance using geometry.
- b. Estimate area under a curve of non-linear functions using rectangles, trapezoids and technology.
- c. Define the limit of the sums of the area as the definite integral.
- d. Use the Fundamental Theorem of Calculus to find antiderivatives of elementary functions.
- e. Define the indefinite integral and antiderivative function.

UNIT VIII: Applications of Integration

Goal. The student will demonstrate the ability to use a problem solving approach to apply integration to model, analyze, and solve real-world problems.

Objectives – The student will be able to:

- a. Find the area between two curves.
- b. Solve problems in Science and Economics. Examples may include Present and Future Value, Supply and Demand, Population Growth, and Average Value.
- c. Solve problems involving probability and statistics.