

**M CC124**  
**Logarithmic and Exponential Functions**  
**Course Objectives**

**Unit 1: Functions**

1.1 Evaluate and Graph Relations and Functions

1.1.1 Determine whether or not a relation is a function.

1.1.2 Build a table and graph for a function.

1.1.3 Identify the domain and range of a function.

1.2 Evaluate functions to determine average rates of change.

1.2.1 Given a function determine the average rate of change between two points.

1.2.2 Given a function compute and simplify  $\frac{f(x+h) - f(x)}{h}$ .

1.3 Solve equations related to functions

1.3.1 Given an output solve for the input algebraically.

1.3.2 Given an output solve for the input graphically.

1.4 Compose Functions

1.4.1 Given two functions,  $f$  and  $g$ , find and compare  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .

1.4.2 Given a function write it as the composition of two functions.

1.5 Given a function, find its inverse

1.5.1 Identify the inverse of a function numerically and graphically

1.5.2 Given a table, graph or rule for a function, determine whether or not its inverse is a function.

1.5.3 Given  $f$  determine  $f^{-1}$  and compose  $f$  with  $f^{-1}$  and  $f^{-1}$  with  $f$ .

**Unit 2: Introduction to Exponential and Logarithmic Functions**

2.1 Write and evaluate functions of the form  $y = ab^x$ .

2.1.1 Given a growth or decay situation write an exponential function and evaluate it for a given input.

2.1.2 Given a table of exponential data determine an exponential function and evaluate it for a given input.

2.2 Graph and interpret graphs of functions of the form  $y = ab^x$ .

2.2.1 Given an exponential function identify its graph.

2.2.2 Given the graph of an exponential function identify the equation.

2.2.3 Solve exponential equations numerically and graphically.

2.3 Write and evaluate functions of the form  $y = \log_b x$

2.3.1 Given an exponential function determine its inverse function and build a table and graph.

2.3.2 Compute logarithms

2.4 Interpret graphs of functions of the form  $y = \log_b x$  and solve equations.

2.4.1 Given the graph of a logarithmic function identify the equation.

2.4.2 Solve basic logarithmic equations algebraically

2.5 Interpreting  $y = ae^x$  and  $y = \ln x$ .

2.5.1 Graph  $y = e^x$  and  $y = \ln x$ .

2.5.2 Solve problems using the model  $y = ae^x$ .

### **Unit 3: Properties of Logs and the Exponential Function**

3.1 Translate between exponential and logarithmic forms.

3.1.1 Simplify  $b^{\log_b u}$ .

3.1.2 Simplify  $\log_b b^u$ .

3.2 Develop and apply properties of logarithms I

3.2.1 Develop the product and quotient rules.

3.2.2 Apply the product and quotient rules.

3.2.3 Develop and apply the power rule.

3.3 Develop and apply properties of logarithms II

3.3.1 Use properties to rewrite logarithms

3.3.2 Use properties to rewrite expressions as single logarithms.

3.4 Derive and apply the base-changing formula

3.4.1 Compute logarithms using the base changing formulas

3.4.2 Build tables and graphs of logarithmic functions in other bases.

3.5 Convert between the forms  $y = ab^x$  and  $y = ae^{kx}$ .

3.5.1 Convert from the form  $y = ab^x$  to  $y = ae^{kx}$  and compare

3.5.2 Convert from the form  $y = ae^{kx}$  to  $y = ab^x$  and interpret

### **Unit 4: Modeling with Exponentials and Logarithms**

4.1 Solve exponential equations and their applications

4.1.1 Simplify and solve equations of the form  $b^u = b^v$ .

4.1.2 Solve exponential equations using logarithms or technology.

4.2 Solve logarithmic equations and their applications

4.2.1 Simplify and solve equations of the form  $\log_b u = \log_b v$ .

4.2.2 Solve equations of the form  $\log_b u = v$ .

4.3 Model real world situations with exponential models.

4.3.1 Solve growth and decay problems.

4.3.2 Fit an exponential function to data and solve related problems.

4.4 Model real world situations with logarithmic models.

4.4.1 Solve problems involving decibels.

4.4.2 Solve problems using pH.

4.5 Solve logistic growth problems.

4.5.1 Solve problems using logistic models

4.5.2 Determine a logistic model given a situation and solve related problems.