

MATH 124

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 Perform operations on functions
 - 1.4.1 Perform basic operations on functions.
 - 1.4.2 Given two functions, f and g , find and compare $(f \circ g)(x)$ and $(g \circ f)(x)$.
 - 1.4.3 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.