

Virginia Western Community College

MTH 161

Pre-Calculus I

Prerequisites

Satisfies MTE 1-9 or MDE 60; or Corequisite MDE 61

Course Description

Presents topics in power, polynomial, rational, exponential and logarithmic functions, and systems of equations and inequalities. Credit will not be awarded for both MTH 161: Precalculus I and MTH 167 Precalculus with Trigonometry. This is a Passport and UCGS transfer course

Semester Credits: 3

Lecture Hours: 3

Required Materials

Textbook:

Precalculus. Sullivan. 11th edition. Pearson. ISBN: 9780135189405.

Other Required Materials:

Scientific Calculator

Course Outcomes

MTH 161 is designed to prepare students for a course in statistics or applied calculus sequence by providing them with the necessary competencies in algebra and functions.

At the completion of this course, the student should be able to:

- Relations and Functions
 - Distinguish between relations and functions.
 - Evaluate functions both numerically and algebraically.
 - Determine the domain and range of functions in general, including root and rational functions.
 - Perform arithmetic operations on functions, including the composition of functions and the difference quotient.
 - Identify and graph linear, absolute value, quadratic, cubic, and square root functions and their transformations.
 - Determine and verify inverses of one-to-one functions.
- Polynomial and Rational Functions
 - Determine the general and standard forms of quadratic functions.
 - Use formula and completing the square methods to determine the standard form of a quadratic function.
 - Identify intercepts, vertex, and orientation of the parabola and use these to graph quadratic functions.

- Identify zeros (real-valued roots) and complex roots, and determine end behavior of higher order polynomials and graph the polynomial, and graph.
- Determine if a function demonstrates even or odd symmetry.
- Use the Fundamental Theorem of Algebra, Rational Root test, and Linear Factorization Theorem to factor polynomials and determine the zeros over the complex numbers.
- Identify intercepts, end behavior, and asymptotes of rational functions, and graph.
- Solve polynomial and rational inequalities.
- Interpret the algebraic and graphical meaning of equality of functions ($f(x) = g(x)$) and inequality of functions ($f(x) > g(x)$)
- Exponential and Logarithmic Functions
 - Identify and graph exponential and logarithmic functions and their transformations.
 - Use properties of logarithms to simplify and expand logarithmic expressions.
 - Convert between exponential and logarithmic forms and demonstrate an understanding of the relationship between the two forms.
 - Solve exponential and logarithmic equations using one-to-one and inverse properties.
 - Solve application problems involving exponential and logarithmic functions.
- Systems of Equations
 - Solve three variable linear systems of equations using the Gaussian elimination method.

Topical Description

Chapter 1: Graphs

- 1.1 Distance and Midpoint Formulas
- 1.2 Equations in Two Variables
- 1.3 Lines
- 1.4 Circles

Chapter 2: Functions and Their Graphs

- 2.1 Functions
- 2.2 The Graph of a Function
- 2.3 Properties of Functions
- 2.4 Library of Functions; Piecewise-defined Functions
- 2.5 Graphing Techniques: Transformations
- 2.6 Mathematical Models: Constructing Functions

Chapter 3: Polynomial and Rational Functions

- 3.1 Linear Models and Properties
- 3.2 Building Linear Functions from Data (optional)
- 3.3 Quadratic Functions and Their Properties
- 3.4 Quadratic Models
- 3.5 Rational Inequalities

Chapter 4: Polynomial and Rational Functions

- 4.1 Polynomial Functions
- 4.2 Graphing Polynomial Functions; Models

- 4.3 Properties of Rational Functions
- 4.4 The Graph of a Rational Functions
- 4.5 Polynomial and Rational Inequalities
- 4.6 The Real Zeros of a Polynomial Function
- 4.7 Complex Zeros; Fundamental Theorem of Algebra

Chapter 5: Exponential and Logarithmic Functions

- 5.1 Composite Functions
- 5.2 Inverse Functions
- 5.3 Exponential Functions
- 5.4 Logarithmic Functions
- 5.5 Properties of Logarithms
- 5.6 Logarithmic and Exponential Equations
- 5.7 Compound Interest
- 5.8 Exponential Growth and Decay; Newton's Law; Logistic Models
- 5.9 Fitting Data to Exponential, Logarithmic and Logistic Functions (optional)

Chapter 11: Systems of Equations

- 11.2 Systems of Linear Equations; Matrices
- 11.3 Determinants
- 11.4 Matrix Algebra

Notes to Instructors

1. The final exam must be comprehensive.