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. 12th edition. Pearson. ISBN: 9780138279004.

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

Notes to Instructors

1. The final exam must be comprehensive.

ADA Statement (PDF)
Title IX Statement (PDF)