Virginia Western Community College
MTH 161
Pre-Calculus I

Prerequisites

Competency in MTE 1-9 as demonstrated through placement or unit completion or equivalent OR Corequisite MCR 6: Learning Support for Precalculus I.

Course Description

Presents topics in power, polynomial, rational, exponential and logarithmic functions, and systems of equations.

Semester Credits: 3   Lecture Hours: 3

Required Materials

Textbook:
Precalculus. Sullivan. 10th edition. Pearson. ISBN: 9780321979070.

Other Required Materials:
Scientific Calculator

Course Outcomes

MTH 161 is designed for students preparing for the fields of business, science, technology, engineering, and mathematics with the intent to pursue further coursework in calculus and beyond. MTH 167 covers the material of MTH 161 plus the study of trigonometric (circular) functions.

At the completion of this course, the student should be able to:
* 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.
* 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 ($f(x) > g(x)$)
- Decompose partial fractions of the form $P(x)/Q(x)$ where $Q(x)$ is a product of linear factors.
- 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.
- 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 Properties of Rational Functions
4.3 Graphs of Rational Functions
4.4 Polynomial and Rational Inequalities
4.5 The Real Zeros of a Polynomial Function
4.6 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.