

# Virginia Western Community College

## MCR 6

### Learning Support for Precalculus 1

#### **Prerequisites**

Completion of any seven (7) of the MTE modules MTE 1; MTE 2; MTE 3; MTE 4; MTE 5; MTE 6; MTE 7; MTE 8; and MTE 9

#### **Corequisites**

MTH 161: Pre-Calculus 1

#### **Course Description**

Provides instruction for students who require minimum preparation for college-level Precalculus. Students in this course will be co-enrolled in MTH 161. Credits not applicable toward graduation and do not replace MTE courses waived. Successful completion of Precalculus I results in the prerequisite MTE modules being satisfied. Lecture 2 hours. Total 2 hours per week.

**Semester Credits: 2**

**Lecture Hours: 2**

#### **Required Materials**

##### **Textbook:**

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

##### **Other Required Materials:**

Scientific Calculator

#### **Course Outcomes**

**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**

- MCR 6 is designed to provide support to students so they can be successful in MTH 161. Instructors must be open and flexible in their planning to meet students where they are in their understanding of the content. Instructors of MCR 6 must communicate with the instructor(s) of MTH 161 to know the pacing and expectations for their students.
- No additional, outside of class, assignments should be given
- Students are graded as S/U
  - S (successful): students attended and participated in class, passed MTH 161 with a C or better
  - U (unsuccessful): students did not attend/participate in class, received F or D in MTH 161