**J. Sargeant Reynolds Community College**
**Course Content Summary**

**Course Prefix and Number: MTH 167** **Credits: 3**

**Course Title: PreCalculus with Trigonometry**

## Course Description

Presents topics in power, polynomial, rational, exponential, and logarithmic functions, systems of equations, trigonometry, and trigonometric applications, including Law of Sines and Cosines. Provides an introduction to conics. Credit will not be awarded for both MTH 167 and 161/162 or equivalent. This is a Passport and UCGS transfer course. Prerequisite: Placement in MTH 167. Lecture 5 hours. Total 5 hours per week. 5 credits

## General Course Purpose

The general purpose of this one-semester course is to prepare students for the skills and level of rigor needed for successful study in a sequence of courses in calculus with analytic geometry.

## Course Prerequisites/Corequisites

Prerequisite: Placement in MTH 167

## Course Objectives

Upon completing the course, the student will 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 and Inequalities*

- Solve three variable linear systems of equations using the Gaussian elimination method.

*Trigonometric Functions*

- Identify angles in standard form in both degree and radian format and convert from one to the other.
- Find the arc length.
- Find the value of trigonometric functions of common angles without a calculator using the unit circle and right triangle trigonometry.
- Use reference angles to evaluate trig functions.
- Find the value of trigonometric functions of angles using a calculator.
- Use fundamental trigonometric identities to simplify trigonometric expressions.
- Graph the six trigonometric functions using the amplitude, period, phase and vertical shifts.
- Use trig functions to model applications in the life and natural sciences.

*Analytic Trigonometry*

- Use the fundamental, quotient, Pythagorean, co-function, and even/odd identities to verify trigonometric identities.
- Use the sum and difference, double angle, half-angle formulas to evaluate the exact values of trigonometric expressions.
- Determine exact values of expressions, including composite expressions, involving inverse trigonometric functions.
- Solve trigonometric equations over restricted and non-restricted domains.

*Applications of Trigonometry*

- Solve right triangles and applications involving right triangles.
- Use the Law of Sines and Cosines to solve oblique triangles and applications.

*Conics*

- Identify the conic sections of the form: $Ax^2 + By^2 + Dx + Ey + F = 0$ $Ax^2 + By^2 + Dx + Ey + F = 0$.
- Write the equations of circles, parabolas, ellipses, and hyperbolas in standard form centered both at the origin and not at the origin.
- Identify essential characteristics unique to each conic.
- Graph equations in conic sections, centered both at the origin and not at the origin.
- Solve applications involving conic sections.
- *Sequences and Series (Optional unit at the discretion of the department.)*
- Identify the terms of geometric sequences.
- Find a particular term of geometric sequence.
- Determine the formula for the $a_n$ term of geometric sequences.
- Find the sum of first *n* terms of finite geometric series.
- Find the sum of infinite geometric series.
- Introduce arithmetic concepts as time allows.

**Major Topics to be Included**

- Relations and Functions
- Polynomial and Rational Functions
- Exponential and Logarithmic Functions
- Systems of Equations and Inequalities

- Trigonometric Functions
- Analytic Trigonometry
- Applications of Trigonometry
- Conics

**Effective Date/Updated:** December 2021