



Course Description

MAC 1147 | Pre-Calculus Algebra and Trigonometry | 5.00 credits

The course will cover the properties and graphs of algebraic, exponential, and logarithmic functions, piecewise-defined functions, the fundamental theorem of algebra, solutions of polynomial equations, conic sections, systems of equations, matrices, and determinants. Arithmetic and geometric sequences and series, the binomial theorem, graph of trigonometric functions and inverse trigonometric functions, the fundamental trigonometric identities, solutions to conditional trigonometric equations, solutions for both right and oblique triangles, operations on complex numbers in trigonometric form, vectors, graphs of polar and parametric equations, and solutions of applications and modeling problems related to the above topics. Computational course.

Course Competencies:

Competency 1: The student will demonstrate knowledge of piecewise defined functions by:

1. Graphing advanced piecewise defined functions

Competency 2: The student will demonstrate knowledge of exponential and logarithmic functions, their properties, and their graphs by:

1. Defining the exponential and logarithmic functions and their inverse relationship
2. Evaluating exponential and logarithmic expressions
3. Graphing the exponential and logarithmic functions with and without transformations
4. Identifying the domain and range of an exponential or logarithmic function
5. Applying properties of logarithms to expand and condense logarithmic expressions
6. Solving exponential and logarithmic equations
7. Applying modeling techniques to solve problems of exponential growth and decay

Competency 3: The student will demonstrate knowledge of polynomial functions by:

1. Analyzing the graph of a polynomial function, its behavior near its zeros and its end behavior
2. Stating the Fundamental Theorem of Algebra
3. Using appropriate rules or theorems to determine the existence, multiplicity, location, and classification of real and complex zeros of a polynomial function
4. Sketching the graph of a polynomial function
5. Building a polynomial function given its zeros and their multiplicity or its graph

Competency 4: The student will demonstrate knowledge of rational functions by:

1. Determining the domain of rational functions
2. Graphing rational functions
3. Analyzing the behavior of a rational function near the point of discontinuity and the end behavior

Competency 5: The student will demonstrate knowledge of polynomial and rational equations and inequalities by:

1. Solving systems of non-linear equations
2. Solving linear and non-linear inequalities
3. Graphing their solution set

Competency 6: The student will demonstrate knowledge of conic sections by:

1. Identifying conic sections as the result of intersecting a plane with a cone
2. Identifying and graphing the different conic sections
3. Writing an equation for a conic in a standard or general form, where applicable, by identifying the corresponding parts of the conic
4. Solving application problems involving parabolas, ellipses, and hyperbolas

Competency 7: The student will demonstrate knowledge of matrices and determinants by:

1. Defining matrices and dimensions of matrices
2. Performing algebraic operations on matrices
3. Evaluating determinants
4. Solving linear systems using matrices and determinants
5. Identifying consistent and inconsistent systems

Competency 8: The student will demonstrate knowledge of sequences and series by:

1. Defining sequences and series (including arithmetic and geometric)
2. Writing the term of sequences
3. Finding the sums of series (including arithmetic and geometric)
4. Defining sequences by using the general term or a recursive formula
5. Using the summation notation properties to express and evaluate sums

Competency 9: The student will demonstrate knowledge of mathematical induction by:

1. Proving that a given formula is true through the Principle of Mathematical Induction

Competency 10: The student will demonstrate knowledge of the Binomial Theorem by:

1. Expanding a binomial using the Binomial Theorem
2. Finding the n th term of a binomial sequence

Competency 11: The student will demonstrate an understanding of the trigonometric functions by:

1. Defining the trigonometric functions in three different ways: as ratios of sides of a right triangle, as functions of an angle in standard position in a Cartesian plane, and as functions of a real number, as represented by an arc length along the unit circle
2. Finding the domain and range of the trigonometric functions
3. Graphing the trigonometric functions both with and without transformations
4. Finding approximate values of the trigonometric functions using a calculator
5. Finding exact values of select trigonometric functions and their equivalent radians

Competency 12: The student will demonstrate an understanding of the trigonometric functions by:

1. Defining the inverse of trigonometric functions and stating their domains and ranges.

Competency 13: The student will demonstrate an understanding of trigonometric identities by:

2. Simplifying trigonometric expressions
3. Finding exact values of trigonometric functions of the sum of angles, differences of angles, double angle, and half-angle formulas
4. Using fundamental identities and the sum of angles, differences of angles, double angle, half-angle, product to sum, and sum to product formulas to establish identities
5. Using inverse trigonometric functions to solve equations

Competency 14: The student will demonstrate an ability to solve trigonometric equations by:

1. Finding all real solutions over a given interval
2. Finding all real solutions (general solutions) when a specified interval is not given
3. Using fundamental identities and the sum of angles, differences of angles, double angle, half-angle, product to sum, and sum to product formulas to solve equations

Competency 15: The student will demonstrate knowledge of solving triangles by

1. Solving right triangles
2. Solving oblique triangles using the Law of Sines and the Law of Cosines

Competency 16: The student will demonstrate an understanding of complex numbers in trigonometric form by:

1. Converting a complex number from standard form $(a + bi)$ to trigonometric form and vice versa

2. Multiplying and dividing complex numbers in trigonometric form
3. Raising complex numbers to positive integer powers using DeMoivre's Theorem
4. Finding the n th complex roots of a complex number

Competency 17: The student will demonstrate an understanding of vectors by:

1. Graphing vectors
2. Performing operations with vectors that include adding and subtracting vectors algebraically and geometrically and scalar multiples of vectors
3. Resolving vectors into components
4. Adding vectors algebraically, both in component form and when expressed as a linear combination

Competency 18: The student will demonstrate an understanding of parametric equations by:

1. Sketching the graphs of curves defined parametrically
2. Finding rectangular equations for curves defined parametrically and vice versa

Competency 19: The student will demonstrate an understanding of polar coordinates by:

1. Converting from rectangular coordinates to polar coordinates and vice versa
2. Transforming rectangular equations into polar equations and vice versa
3. Graphing polar equations

Competency 20: The student will demonstrate an understanding of applications of trigonometry by: Solving applications with arc lengths and areas of circular sectors

1. Solving applications with right triangles
2. Solving applications with oblique triangles
3. Solving applications with vectors

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Create strategies that can be used to fulfill personal, civic, and social responsibilities