

COURSE OUTLINE **Pre-Calculus Mathematics**

Course Description

MA 145. Pre-Calculus Mathematics. 5 hours credit. Prerequisite: Placement score or MA 125 with a B or better. This course will enable the student to develop and apply models using linear, polynomial, rational, logarithmic, exponential, and trigonometric functions. The successful student will be able to identify and manipulate functions, solve equations, prove trigonometric identities, solve triangles, and use polar coordinates. This course is designed for students planning to enroll in MA 151.

Course Relevance

The concepts learned in this course will raise the student's level of preparation for calculus. The student's appreciation and understanding of the way mathematics describes our world will improve. Algebra and trigonometry have applications in a vast number of fields including agriculture, construction, health, and weather.

Required Materials

Larson, R., Hostetler, R. and Edwards, B. (2008). *Precalculus: A graphing approach* (5th ed.). Boston, MA: Houghton Mifflin Company.

Graphing Calculator: TI-83, TI-83+, TI-84 or TI-84+ is recommended. If another calculator is used, the student is responsible for learning how to use it.

Learning Outcomes

The intention is for the student to be able to:

1. Recognize algebraic and trigonometric functions.
2. Use technology to work with the algebraic and trigonometric functions.
3. Use algebra and trigonometry in more advanced coursework.
4. Use algebra and trigonometry in applications.

Learning PACT Skills that will be DEVELOPED and/or documented in this course

Through the student's involvement in this course, he/she will develop his/her ability in the following PACT skill areas:

Analytical Thinking Skills

1. Problem Solving
 - Through work with functions, equations, triangles, and graphs, the student will expand his/her ability in problem solving.
2. Critical Thinking
 - The student will develop critical thinking skills in application problems, modeling, and work with identities.

Major Summative Assessment Task(s)

These learning outcomes and the Learning PACT skills will be demonstrated by

1. Completion of a comprehensive individual or collaborative assessment tool. This tool will involve processing algebraic and trigonometric functions and equations, including application/model problems, and problems using identities.

Course Content

- I. Key Themes – Key recurring concepts that run throughout this course:
 - A. Algebraic functions and equations
 - B. Trigonometric functions and equations
 - C. Identities
 - D. Modeling/Applications
- II. Issues – Key areas of conflict that must be understood in order to achieve the intended outcome:
 - A. Improving basic mathematical skills to prepare for advanced courses
 - B. Analytical problem solving vs. solving with technological tools
 - C. Recognizing when a solution is reasonable
- III. Concepts – Key concepts that must be understood to address the issues:
 - A. Basic arithmetic and algebra
 - B. Basic problem solving
- IV. Skills/Competencies – Actions that are essential to achieve the course outcomes:
 - A. Manipulate functions
 - B. Solve equations
 - C. Manipulate trigonometric identities
 - D. Set up models/application problems
 - E. Interpret graphs

Learning Units

- I. Functions and their graphs
 - A. Graphs of functions
 - B. Lines in the plane
 - C. Functions
 - D. Graphs of functions
 - E. Shifting, reflecting, and stretching graphs
 - F. Combinations of functions
 - G. Inverse functions
- II. Solving equations and inequalities
 - A. Solving inequalities algebraically and graphically
 - B. Linear models and scatter plots
- III. Polynomial and rational functions
 - A. Quadratic functions
 - B. Polynomial functions of higher degree
 - C. Real zeros of polynomial functions
 - D. The fundamental theorem of algebra

- E. Rational functions and asymptotes
- F. Graphs of rational functions
- G. Quadratic models

IV. Exponential and logarithmic functions

- A. Exponential functions and their graphs
- B. Logarithmic functions and their graphs
- C. Properties of logarithms
- D. Solving exponential and logarithmic equations
- E. Exponential and logarithmic models
- F. Nonlinear models

V. Trigonometric functions

- A. Angles and their measure
- B. Right triangle trigonometry
- C. Trigonometric functions of any angle
- D. Graphs of sine and cosine functions
- E. Graphs of other trigonometric functions
- F. Inverse trigonometric functions
- G. Applications and models

VI. Analytic trigonometry

- A. Using fundamental identities
- B. Verifying trigonometric identities
- C. Solving trigonometric equations
- D. Sum and difference formulas
- E. Multiple-angle and product-to-sum formulas

VII. Additional topics in trigonometry

- A. Law of Sines
- B. Law of Cosines

Learning Activities

Independent and collaborative learning activities will be assigned to assist the student to achieve the intended learning outcomes. Class discussion, lecture, reading and problem assignments, and calculator work will also contribute to the learning process.

Grade Determination

The student will be graded on assessment tasks and other activities such as exams and assignments.