The College of New Jersey
Mathematics and Statistics Department

MAT 096: Precalculus **0 course units**

I. Course Description

The purpose of the course is to prepare students for a Calculus course. Topics include: fundamentals of algebra, trigonometry, exponentials, logarithms, and analytic geometry. Stress is on computational and problem-solving techniques.

II. Course Objectives

The student should be able to:

a. Demonstrate basic properties of real numbers.
b. Perform fundamental operations on algebraic and transcendental functions and simplify the results.
c. Determine the domain and range of these functions, including composite functions.
d. Sketch graphs of these functions by an analysis of their properties rather than by merely plotting sets of points.
e. Find the zeros of functions and solve algebraic and trigonometric equations.
f. Perform operations with trigonometric functions.
g. Apply analytical geometry to distance, line, and conics.
h. Solve "verbal" problems relating to applications.

III. Course Outline

The course will cover the following concepts. The specific list of topics and sections to be covered is appended to this document.

a. Review of sets, intervals, Cartesian coordinates, graphs.
b. Functions: range, domain, inverse functions.
c. Analytic Geometry: slopes of lines, distance formula, linear equations, translation of coordinates, equations of all conics with translations, symmetry, odd and even functions.
d. Algebra: polynomials, roots of polynomials of low degree, graphs of polynomial functions, basic rational functions

e. Trigonometry: Angular measure, basic trigonometric functions and their graphs, basic trigonometric identities and equations
f. Logarithmic and exponential equations, graphs, logarithmic techniques for solving equations.

IV. **Teaching Methods**

a. An attempt will be made to use realistic problem situations to provide motivation for consideration of the mathematical and theoretical aspects of the course.
b. Introduction and formal presentation of basic concepts by the instructor and/or capable students.
c. Each student will make adequate use of an electronic calculator through application to concrete problem situations.
d. Outside projects to meet the needs and/or interests of individuals or groups will be pursued and presented to the class if merited.

V. **Course Requirements**

a. Satisfactory understanding of basic mathematical skills and concepts.
b. Student's ability will be measured by:
    i. Class participation
    ii. Assignments
    iii. Written examinations

VI. **Course Evaluation**

a. By Students
    i. Student evaluations.
b. By Colleagues
    i. Departmental discussions
    ii. Consultation with other departments the course serves

VII. **Bibliography**

a. J. Stewart, L. Redlin, S. Watson, *Precalculus: Mathematics for Calculus (7th Edition),* Cengage Learning.

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Precalculus Topics List

1. Chpater 1
    a. 1.4: Rational Expressions
    b. 1.5: Equations
    c. 1.7 Modeling with Equations
    d. 1.8: Inequalities
    e. 1.9: Graphs of Functions
    f. 1.10: Lines
    g. 1.11: Solving Equations and Inequalities Graphically
2. Chapter 2
    a. 2.1: Functions
    b. 2.2: Graphs of Functions
    c. 2.3: Getting Values from the Graph of a Function
    d. 2.6: Transformations of Functions
    e. 2.7: Combining Functions
    f. 2.8: Inverse Functions (Should be emphasized
3. Chapter 3
    a. 3.1: Quadratic Functions and Models
    b. 3.2: Polynomials Functions and Their Graphs
    c. 3.3: Dividing Polynomials
        i. Long Division of Polynomials, Remainder and Factor Theorem, but omit Synthetic Division
    d. 3.6: Rational Functions
4. Chapter 4 (This chapter should be emphasized)
    a. 4.1: Exponential Functions
    b. 4.2: The Natural Exponential Function
    c. 4.3: Logarithmic Functions (Jeremy didn't know)
    d. 4.4: Laws of Logarithms
    e. 4.5: Exponential and Logarithmic Functions
    f. 4.6: Modeling with Exponential Functions
5. Chapter 5
    a. 5.1: Unit Circle
    b. 5.2: Trigonometric Functions of Real Numbers
    c. 5.3: Trigonometric Graphs
    d. 5.4: More Trigonometric Graphs
    e. 5.5: Inverse Trigonometric Functions
6. Chapter 6
    a. 6.1: Angle Measures
    b. 6.2: Trigonometric Functions for Right Triangles
    c. 6.3: Trigonometric Functions of Angles
    d. 6.4: Inverse Trigonometric Functions and Right Triangles
7. Chapter 7
    a. 7.1: Trigonometric Identities
    b. 7.2: Addition/Subtraction Identities
    c. 7.3: Double/Half-Angle Formulas
    d. 7.4: Basic Trigonometric Equations