Modesto Junior College
Course Outline of Record

MATH 122

I. OVERVIEW
The following information will appear in the 2009 - 2010 catalog

MATH 122  Pre-Calculus 2  5 Units
Together with MATH 121, a two-semester Precalculus course sequence. A comprehensive
course in analytic geometry and trigonometry. Topics include: vectors, rotation of axes, conic
sections, polar and parametric functions, and trigonometric functions & graphs with
applications.
Prerequisite: Satisfactory completion of MATH 121.
Advisory: Before enrolling in this course, students are strongly advised to satisfactorily
complete MATH 80

Field trips are not required. Units/Hours: 5.00 Units: Lecture - 90.00 hours
Grading: A-F or P/NP - Student choice Transfer: CSU, UC
General Education: D.2 ) (CSU-GE: B4 ) (IGETC: Mathematics )

II. LEARNING CONTEXT
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the
goals specified in Section III, Desired Learning:

A. COURSE CONTENT

1. Required Content:

a. Trigonometric Functions
i. Angles and their Measure
ii. Trigonometric Functions: Unit Circle Approach
iii. Properties of Trigonometric Functions
iv. Right Triangle Trigonometry
v. Graphs of the Trigonometric Functions
vi. Sinusoidal Graphs; Sinusoidal Curve Fitting

b. Analytic Trigonometry
i. Trigonometric Identities
ii. Sum and Difference Formulas
iii. Double-angle and Half-angle Formulas
iv. Product-to-Sum and Sum-to-Product Formulas
v. The Inverse Trigonometric Functions
vi. Trigonometric Equations
c. Applications of Trigonometric Functions
   i. Solving Right Triangles
   ii. The Law of Sines
   iii. The Law of Cosines
   iv. The Area of a Triangle
   v. Simple Harmonic Motion; Damped Motion

d. Polar Coordinates; Vectors
   i. Polar Coordinates
   ii. Polar Equations and Graphs
   iii. The Complex Plane; De Moivre's Theorem
   iv. Vectors
   v. The Dot Product
   vi. Vectors in Space

e. Analytic Geometry
   i. Conics
   ii. The Parabola
   iii. The Ellipse
   iv. The Hyperbola
   v. Rotation of Axes, General Form of a Conic
   vi. Polar Equations of Conics
   vii. Plane Curves and Parametric Equations

B. ENROLLMENT RESTRICTIONS

1. Prerequisites
   Satisfactory completion of MATH 121.

2. Advisories
   Before enrolling in this course, students are strongly advised to satisfactorily complete MATH 80.

3. Requisite Skills
   Before entering the course, the student will be able to:
   a. State and correctly use the Pythagorean theorem
b. Graph quadratic, polynomial, rational, exponential, and logarithmic functions

c. Solve exponential and logarithmic equations

d. Solve quadratic equations by factoring, completing the square, or using the quadratic formula

e. Graph functions via table of values, transformations, and coordinate-wise operations

f. Simplify polynomial and rational expressions

g. Prove theorems using the Principle of Mathematical Induction

h. Construct functions to model given problems

i. Add, subtract, multiply, and divide complex numbers

j. Calculate the slope, distance, and midpoint between two given points

k. Graph linear and quadratic functions and circles

l. Identify the shape, find the center, and sketch the graphs of circles, ellipses, and hyperbolas given in standard form

m. Solve systems of linear equations in two and three variables using the methods of substitution, elimination, matrices, and determinants

C. **HOURS AND UNITS**

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<th>INST METHOD</th>
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D. **METHODS OF INSTRUCTION (TYPICAL)**

Instructors of the course might conduct the course using the following method:

1. Lecture
2. Discussion
3. Demonstration of mathematical techniques
4. Guided practice
5. Homework assignments

E. **ASSIGNMENTS (TYPICAL)**

1. **EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS**

*Time spent on coursework in addition to hours of instruction (lecture hours)*

   a. Daily homework assignments requiring approximately two hours per class hour
   b. Ongoing review of flashcards or study sheet
   c. Preparation for examinations, several times during the term
   d. Preparation for final exam
2. **EVIDENCE OF CRITICAL THINKING**  
*Assignments require the appropriate level of critical thinking*

a. Sketch an accurate graph of a given sine wave, determining and incorporating its amplitude, period, phase shift, and vertical shift.

b. Find the area of a given triangle given a sufficient amount of information about the triangle.

c. Earth rotates on an axis through its poles. The distance from the axis to a location on the surface of Earth at 40 degrees north latitude is about 3033.5 miles. Compute the linear speed on the surface of Earth at 40 degrees north latitude in miles per hour.

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F. **TEXTS AND OTHER READINGS (TYPICAL)**


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III. **DESIRED LEARNING**

A. **COURSE GOAL**  
*As a result of satisfactory completion of this course, the student should be prepared to:*

- graph conic sections in rectangular, parametric and polar form, rotate axes if needed, state and prove trigonometric identities, and solve problems involving trigonometric functions. These skills are vital for success in our calculus courses.

B. **STUDENT LEARNING GOALS**  
*Mastery of the following learning goals will enable the student to achieve the overall course goal.*

1. **Required Learning Goals**  
*Upon satisfactory completion of this course, the student will be able to:*

a. define radian measure of an angle and convert between radian and degree measure.

b. define the trigonometric functions in terms of angles in standard position.

c. define the trigonometric functions in terms of sides and angles of a right triangle.

d. select the appropriate trigonometric functions to calculate the unknown parts of a triangle.

e. sketch the graphs of trigonometric functions, indicating period, amplitude, and phase shift.

f. state the fundamental trigonometric identities.

g. prove trigonometric identities.

h. define and sketch the graphs of the inverse trigonometric functions.

i. solve trigonometric equations.

j. use the trigonometric functions and the inverse trigonometric functions to solve applied problems.

k. use the Laws of Sines and Cosines to solve triangles.

l. plot points in the polar coordinate system.

m. sketch the graphs of polar functions.

n. plot points in the complex plane and calculate their magnitudes.
o. use DeMoivre's Theorem to calculate powers and roots of complex numbers.

p. calculate the magnitude and direction of a vector.

q. calculate the dot product of two vectors.

r. use the rules of vector arithmetic to solve applied problems.

s. sketch the graphs and identify the properties of the conic sections.

t. state and correctly use the focus and/or directrix definition of each conic section.

u. sketch the graphs of the conic sections under rotation of axes.

v. identify and sketch the graphs of conic sections given in polar form.

w. sketch the graphs of parametric functions.

IV. METHODS OF ASSESSMENT (TYPICAL)

A. FORMATIVE ASSESSMENT

1. Midterm exams (excluding the following formats: multiple choice, open book, take home)

2. Quizzes

3. Homework assignments

4. Participation

B. SUMMATIVE ASSESSMENT

1. Comprehensive 2 to 3 hour Final Exam (excluding the following formats: multiple choice, open book, take home)