MATH 48C: PRECALCULUS III

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2025
Units:	5
Hours:	5 lecture per week (60 total per quarter)
Prerequisite:	MATH 48B.
Advisory:	Demonstrated proficiency in English by placement via multiple measures OR through an equivalent placement process OR completion of ESLL 125 & ESLL 249; UC credit for MATH 48A, 48B and 48C is limited to a maximum of 7.5 units for the combination or any portion of the series completed.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Area 2: Mathematical Concepts & Quantitative Reasoning
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Students will model, solve, and interpret applications using trigonometric functions, parametric and polar curves, and vectors.
- Students will develop conceptual understanding of trigonometric functions and parametric equations. They will demonstrate and communicate this understanding by graphing, analyzing, and transforming these functions and connecting their multiple representations.
- Students will solve triangles, trigonometric equations, and problems with vectors.

Description

This course is a continuation of topics from MATH 48B. Topics include the six trigonometric functions, trigonometric identities, inverse trigonometric functions, trigonometric equations, right triangles, oblique triangles, vectors, parametric equations, and applications with various functions.

Course Objectives

The student will be able to:

1. Evaluate the trigonometric functions at an angle whose measure is given in degrees and radians
2. Investigate angles and aspects of a circle
3. Identify special triangles and their related angle and side measures
4. Define and analyze the geometric properties of the unit circle
5. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs and model real-world phenomena with trigonometric functions
6. Evaluate and graph inverse trigonometric functions
7. Prove trigonometric identities
8. Manipulate and simplify a trigonometric expression
9. Solve trigonometric equations and applications
10. Solve right triangles and oblique triangles
11. Convert between polar and rectangular coordinates and graph functions and relations in rectangular coordinates and polar coordinates
12. Graph and analyze functions using parametric equations
13. Represent a vector in the form and ai+bj
14. Calculate powers and roots of complex numbers using DeMoivre's Theorem
15. Use technology, such as graphing calculators and/or computer software to assist in solving problems involving any of the topics in (1) through (14) above
16. Discuss mathematical problems and write solutions in accurate mathematical language and notation
17. Interpret mathematical solutions

Course Content

1. Evaluate the trigonometric functions at an angle whose measure is given in degrees and radians
   a. Convert from degrees to radians
   b. Convert from radians to degrees
   c. Define sine, cosine, tangent, cotangent, cosecant and secant functions
   d. Evaluate sine, cosine, tangent, cotangent, cosecant and secant functions at a given angle
2. Investigate angles and aspects of a circle
   a. Study angles, converting between radian and degree measures
   b. Investigate relationship between arc length and radius of a circle
   c. Solve arc length and area of a sector problems
   d. Solve circular motion problems for angular and linear speed
3. Identify special triangles and their related angle and side measures
   a. Analyze the 30-60-90 and 45-45-90 triangles
   b. Find exact trigonometric values for angles that are multiples of 30 degrees or multiples of 45 degrees
4. Define and analyze the geometric properties of the unit circle
   a. Describe the relationship between the six trigonometric functions and the coordinates of a point on the unit circle
   b. Use reference angles to determine trigonometric function values
   c. Right triangles
5. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs and model real-world phenomena with trigonometric functions
   a. Determine if a real-world phenomena is periodic using a graph or table of values
   b. Extrapolate function values for a periodic function given in a graph or table
   c. Interpret amplitude, period, frequency, and shifts within the context of an application
   d. Find the domain and range of trigonometric functions
   e. Use the unit circle to construct the graphs of the six trigonometric functions on the rectangular coordinate system
   f. Graph sine and cosine functions from equations and tables, including transformations

   g. Generate equations for sine and cosine functions from tables and graphs
   h. Use sine and cosine functions to model real-world phenomena
   i. Define tangent, cotangent, secant and cosecant in terms of sine and cosine
   j. Graph tangent, cotangent, secant and cosecant functions and transformations of these functions
   k. Determine period, amplitude, phase shift, vertical shift and asymptotes of graphs of trigonometric functions
6. Evaluate and graph inverse trigonometric functions
   a. Define, evaluate, and graph the inverse trigonometric functions for sine, cosine, and tangent
   b. Determine the domain and range of a function and its inverse and investigate the relationship between them
   c. Recognize the relationship between the graph of a trigonometric function and its inverse
   d. Compose trigonometric and inverse trigonometric functions
7. Prove trigonometric identities
   a. Develop and use fundamental identities
      i. Pythagorean
      ii. Quotient and reciprocal
      iii. Cofunction
      iv. Odd and even identities
   b. Develop and use other trigonometric identities
      i. Sum and difference of two angles
      ii. Sum to product and product to sum identities
      iii. Double angle identities
      iv. Half angle identities
   c. Apply trigonometric identities to simplify and evaluate trigonometric expressions and verify other identities
8. Manipulate and simplify a trigonometric expression
   a. Describe the difference between a trigonometric expression and an equation
   b. Simplify trigonometric expressions
9. Solve trigonometric equations and applications
   a. Solve trigonometric equations algebraically and graphically, including equations of linear and quadratic types
   b. Solve trigonometric equations in applications
10. Solve right triangles and oblique triangles
   a. Describe the six trigonometric functions using right triangles
   b. Use the appropriate trigonometric ratio to solve real-world problems involving right triangles
   c. Describe the relationships among the trigonometric ratios
   d. Develop the formula for the Law of Sines and Law of Cosines
   e. Apply the Law of Sines and Law of Cosines to real-world scenarios
11. Convert between polar and rectangular coordinates and graph functions and relations in rectangular coordinates and polar coordinates
   a. Graph and classify relations and functions in polar coordinates
   b. Convert between polar and rectangular coordinates and equations
   c. Describe the relationship between polar and rectangular coordinates using trigonometry
12. Graph and analyze functions using parametric equations
   a. Find parametric forms of plane curves
   b. Convert between equations in parametric form and rectangular form
   c. Investigate application problems using parametric equations, such as:
      i. Planetary motion
      ii. Projectiles
13. Represent a vector in the form and ai+bj
   a. Determine the magnitude and direction of a vector
   b. Resolve a vector into components
   c. Add, subtract, and scale vectors graphically and algebraically
   d. Find the dot product of vectors
      i. Use dot product to find the magnitude of a vector
      ii. Find the angle between two vectors
   e. Investigate application problems using vectors, such as:
      i. Static equilibrium problems
      ii. Motion problems
      iii. Work
14. Calculate powers and roots of complex numbers using DeMoivre's Theorem
   a. DeMoivre's Theorem
   b. Applications including roots of complex numbers and powers of complex numbers using DeMoivre's Theorem
15. Use technology, such as graphing calculators and/or computer software to assist in solving problems involving any of the topics in (1) through (14) above
   a. Calculator/computer utilities for evaluating problems involving optimization
   b. Calculator/computer utilities for determining mathematical models using regression
   c. Calculator/computer utilities for finding intersection points for graphs of two functions
   d. Calculator/computer utilities for finding zeros or roots of functions
16. Discuss mathematical problems and write solutions in accurate mathematical language and notation
   a. Application problems from other disciplines
   b. Proper notation
17. Interpret mathematical solutions
   a. Explain the significance of solutions to application problems

Lab Content

Not applicable.

Special Facilities and/or Equipment

1. Access to graphing technology, such as a graphing calculator or graphing software
2. When taught hybrid:
a. Internet access
b. Course management system
c. Specific software related to the course

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Homework

Quizzes
Exams
Proctored comprehensive final exam

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture
Discussion
Cooperative learning exercises

Representative Text(s) and Other Materials

Stewart, Redlin, and Watson. Precalculus: Mathematics for Calculus with Corequisite Support, 7th ed.. 2020.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Homework problems covering subject matter from text and related material ranging from 30-60 problems per week. Students will need to employ critical thinking in order to complete assignments.
2. Five hours per week of lecture covering subject matter from text and related material. Reading and study of the textbook, related materials and notes.
3. Student projects covering subject matter from textbook and related materials. Projects will require students to discuss mathematical problems, write solutions in accurate mathematical language and notation and interpret mathematical solutions. Projects may require the use of a computer algebra system such as Mathematica or MATLAB.
4. Worksheets: Problems and activities covering the subject matter. Such problems and activities will require students to think critically. Such worksheets may be completed inside and/or outside of class.

Discipline(s)

Mathematics