

Physical Sciences, Mathematics & Engineering Division
MATH 48C
PRECALCULUS III

Summer 2014

5 hours lecture.

5 Units

Total Quarter Learning Hours: 60 (*Total of All Lecture, Lecture/Lab, and Lab hours X 12*)

Lecture Hours: 5

Lab Hours:

Lecture/Lab:

Note: If Lab hours are specified, see *item 10. Lab Content* below.

Repeatability -

Statement:

Not Repeatable.

Status -

Course Status: Active

Grading: Letter Grade with P/NP option

Degree Status: Applicable

Credit Status: Credit

Degree or Certificate Requirement: Certificate of Achievement, Foothill GE

GE Status: Communication & Analytical Thinking

Articulation Office Information -

Transferability: Both

Validation: 6/10; 11/27/12; 11/16/13

1. 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 modeling data with various functions.

Prerequisite: MATH 48B.

Co-requisite: None

Advisory: Demonstrated proficiency in English by placement into ENGL 1A as determined by score on the English placement test or through an equivalent placement process; UC credit for MATH 48A, B & C is limited to a maximum of 7.5 units for the combination or any portion of the series completed.

2. Course Objectives -

The student will be able to:

- 1 Analyze periodic functions using a graph and table of data.
- 2 Investigate angles and aspects of a circle
- 3 Define and analyze the geometric properties of the unit circle.
- 4 Graph sine and cosine functions and model real-world data with trigonometric functions.
- 5 Investigate other trigonometric functions
- 6 Analyze inverse trigonometric functions
- 7 Solve right triangles and oblique triangles
- 8 Graph and analyze functions and relations expressed in polar coordinates and parametric equations
- 9 Perform operations with 2D vectors.
- 10 Apply trigonometric identities to simplify and evaluate trigonometric expressions and verify other identities
- 11 Use technology such as graphing calculators and/or computer software to assist in solving problems involving any of the topics in (A) through (J) above
- 12 Discuss mathematical problems and write solutions in accurate mathematical language and notation.
- 13 Interpret mathematical solutions.

3. Special Facilities and/or Equipment -

- 1 Graphing Calculator
- 2 When taught hybrid: Four lecture hours per week in face-to-face contact and one hour per week using CCC Confer. Students need internet access.
- 3

4. Course Content (Body of knowledge) -

- 1 Analyze periodic functions using a graph and table of data.
 - 1 Determine if a real-world data set or graph is periodic
 - 2 Determine the period, midline, amplitude and frequency of a periodic function
 - 3 Extrapolate function values for a periodic function given in a graph or table

- 4 Interpret amplitude, period, frequency, and shifts within the context of an application
- 2 Investigate angles and aspects of a circle
 - 1 Study angles, converting between radian and degree measures
 - 2 Investigate relationship between arc length and radius of a circle
 - 3 Solve arc length and area of a sector problems
 - 4 Solve circular motion problems for angular and linear speed sector area problems
- 3 Investigate the unit circle.
 - 1 Describe the relationship between the cosine and sine functions and the coordinates of a point on the unit circle
 - 2 Find exact trigonometric values for special angles
 - 3 Use reference angles to determine cosine and sine values
- 4 Graph sine and cosine functions and model real-world data with trigonometric functions.
 - 1 Use the unit circle to construct the graphs of the sine and cosine functions
 - 2 Graph sine and cosine functions from equations and tables including transformations
 - 3 Solve trigonometric equations graphically
 - 4 Generate equations for sine and cosine functions from tables and graphs
 - 5 Use sine and cosine functions to model real-world data sets
- 5 Investigate other trigonometric functions
 - 1 Define tangent, cotangent, secant and cosecant in terms of sine and cosine
 - 2 Examine graphs of tangent, cotangent, secant and cosecant functions
- 6 Analyze the inverse trigonometric functions
 - 1 Define, evaluate, and graph the inverse trigonometric functions for sine, cosine, and tangent
 - 2 Determine the domain and range of a function and its inverse and investigate the relationship between them
 - 3 Recognize the relationship between the graph of a trigonometric function and its inverse
 - 4 Solve trigonometric equations algebraically, including equations of linear and quadratic types
 - 5 Compose trigonometric and inverse trigonometric functions
- 7 Solve right triangles and oblique triangles
 - 1 Describe the six trigonometric ratios
 - 2 Use the appropriate trigonometric ratio to solve real-world problems involving right triangles
 - 3 Describe the relationships among the trigonometric ratios
 - 4 Develop the formula for the Law of Sines and Law of Cosines
 - 5 Apply the Law of Sines and Law of Cosines to real-world scenarios
- 8 Graph and analyze functions and relations expressed in polar coordinates and parametric equations
 - 1 Graph and classify equations in polar coordinates
 - 2 Convert between polar and rectangular coordinates

- 3 Describe the relationship between polar and rectangular coordinates using trigonometry
- 4 Find parametric forms of plane curves
- 5 Convert between equations in parametric form and rectangular form.
- 6 Investigate application problems using parametric equations such as:
 - 1 Planetary motion
 - 2 Projectiles
- 9 Perform operations with 2D vectors.
 - 1 Use vectors to model and solve real-world situations
 - 2 Determine the magnitude and direction of a vector
 - 3 Resolve a vector into components
 - 4 Add, subtract, and scale vectors graphically and algebraically
 - 5 Find the dot product of vectors
 - 1 Use dot product to find the magnitude of a vector
 - 2 Find the angle between two vectors
 - 6 Solve equations and systems of equations that arise when solving various problems involving vectors
 - 7 Investigate application problems using vectors such as:
 - 1 Static equilibrium problems
 - 2 Motion problems, such as sliding masses
- 10 Apply trigonometric identities to simplify and evaluate trigonometric expressions and verify other identities
 - 1 Develop and use fundamental identities
 - 1 Pythagorean
 - 2 Quotient and Reciprocal
 - 3 Cofunction
 - 4 Odd and Even Identities
 - 2 Develop and use other trigonometric identities
 - 1 Sum and difference of two angles
 - 2 Sum to Product and Product to Sum identities
 - 3 Double Angle identities
 - 3 Simplify trigonometric expressions
 - 4 Verify trigonometric identities
 - 5 Investigate applications of trigonometric identities
 - 6 Solve equations using trigonometric identities
- 11 Use technology such as graphing calculators and/or computer software to assist in solving problems involving any of the topics in (A) through (J) above
 - 1 Calculator/computer utilities for evaluating problems involving optimization
 - 2 Calculator/computer utilities for determining mathematical models using regression
 - 3 Calculator/computer utilities for finding intersection points for graphs of two functions
 - 4 Calculator/computer utilities for finding zeros or roots of functions
- 12 Discuss mathematical problems and write solutions in accurate mathematical language and notation.
 - 1 Application problems from other disciplines

- 2 Proper notation
 - 13 Interpret mathematical solutions.
 - 1 Explain the significance of solutions to application problems.
5. **Repeatability** - Moved to header area.

6. Methods of Evaluation -

- 1 Homework
- 2 Quizzes
- 3 Exams
- 4 Proctored Comprehensive Final Exam
- 5 Class Participation
- 6 Exploratory worksheets or labs
- 7 Group projects

7. Representative Text(s) -

Wilson, Adamson, Cox and O'Bryan, Precalculus: A Make It Real Approach, 1st Edition, Cengage Learning, 2013.
Stewart, Redlin, and Watson, Precalculus: Mathematics for Calculus, 6th Edition, Cengage Learning, 2012.

8. Disciplines -

Mathematics

9. Method of Instruction -

- 1 Lecture
- 2 Discussion
- 3 Cooperative learning exercises

10. Lab Content -

Not applicable.

11. **Honors Description** - No longer used. Integrated into main description section.

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

- 1 Homework Problems: 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 Lecture: 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 Projects: 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 both inside and/or outside of class.

13. Need/Justification -

This course is a required core course for the AS degree in General Studies Science, a restricted support course for the Certificate of Achievement in Transfer Studies: CSU GE and satisfies the Foothill GE Requirement for Area V, Communication and Analytical Thinking.