

MATH R117: PRECALCULUS AND TRIGONOMETRY

Originator

ptrujillo

College

Oxnard College

Discipline (CB01A)

MATH - Mathematics

Course Number (CB01B)

R117

Course Title (CB02)

Precalculus and Trigonometry

Banner/Short Title

Precalculus and Trigonometry

Credit Type

Credit

Start Term

Fall 2023

Catalog Course Description

This course gives the calculus-bound student a solid foundation in precalculus algebra and analytic trigonometry, with emphasis on function concepts and graphing. Topics include equations and inequalities, analytic geometry of lines and conic sections, properties of functions, techniques of graphing, elementary functions (linear, quadratic, rational, exponential, logarithmic, and trigonometric) and inverse functions, trigonometric identities and equations, polar graphing, optimization applications, systems of equations, theory of equations, mathematical induction, binomial theorem, sequences, and series.

Taxonomy of Programs (TOP) Code (CB03)

1701.00 - Mathematics, General

Course Credit Status (CB04)

D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)

A (Transferable to both UC and CSU)

Course Basic Skills Status (CB08)

N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)

E - Non-Occupational

Course Cooperative Work Experience Education Status (CB10)

N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)

Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)

N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)

Y - Not Applicable

Course Noncredit Category (CB22)

Y - Credit Course

Funding Agency Category (CB23)

Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)

1 - Program Applicable

General Education Status (CB25)

B - Satisfies Math/Quantitative Reasoning req (CSUGE-B B4, IGETC 2, or 4-yr)

Support Course Status (CB26)

N - Course is not a support course

Field trips

Will not be required

Grading method

(L) Letter Graded

Alternate grading methods

(O) Student Option- Letter/Pass

(P) Pass/No Pass Grading

Does this course require an instructional materials fee?

No

Repeatable for Credit

No

Is this course part of a family?

No

Units and Hours

Carnegie Unit Override

No

In-Class

Lecture

Minimum Contact/In-Class Lecture Hours

105

Maximum Contact/In-Class Lecture Hours

105

Activity

Laboratory

Total in-Class

Total in-Class

Total Minimum Contact/In-Class Hours

105

Total Maximum Contact/In-Class Hours

105

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class

Minimum Outside-of-Class Hours

210

Maximum Outside-of-Class Hours

210

Total Student Learning

Total Student Learning

Total Minimum Student Learning Hours

315

Total Maximum Student Learning Hours

315

Minimum Units (CB07)

6

Maximum Units (CB06)

6

Prerequisites

Course taught at the level of intermediate algebra or placement as determined by the college's multiple measures assessment process.

Entrance Skills

Entrance Skills

Algebraic fluency with expressions and equations. Understanding functions and graphs.

Requisite Justification

Requisite Type

Prerequisite

Requisite

Course taught at the level of intermediate algebra or placement as determined by the college's multiple measures assessment process

Requisite Description

Course in a sequence

Level of Scrutiny/Justification

Content review

Student Learning Outcomes (CSLOs)

Upon satisfactory completion of the course, students will be able to:

- | | |
|---|---|
| 1 | Re-write and/or simplify algebraic and trigonometric expressions by using appropriate mathematical properties, identities, and substitutions. |
| 2 | Solve polynomial, exponential, logarithmic, trigonometric, systems of equation and inequalities. |

Course Objectives

Upon satisfactory completion of the course, students will be able to:

- | | |
|----|---|
| 1 | Graph functions and relations in rectangular coordinates and polar coordinates. |
| 2 | Synthesize results from the graphs and/or equations of functions and relations. |
| 3 | Apply transformations to the graphs of functions and relations. |
| 4 | Recognize the relationship between functions and their inverses graphically and algebraically. |
| 5 | Solve and apply equations including rational, linear, polynomial, exponential, absolute value, and logarithmic functions. |
| 6 | Solve linear, nonlinear, and absolute value inequalities. |
| 7 | Solve systems of equations and inequalities. |
| 8 | Apply functions to model real world applications. |
| 9 | Prove trigonometric identities. |
| 10 | Identify special triangles and their related angle and side measures. |
| 11 | Evaluate the trigonometric function at an angle whose measure is given in degrees and radians. |
| 12 | Manipulate and simplify a trigonometric expression. |
| 13 | Solve trigonometric equations. |
| 14 | Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs. |
| 15 | Evaluate and graph inverse trigonometric functions. |
| 16 | Convert between polar and rectangular coordinates. |
| 17 | Calculate powers and roots of complex numbers using DeMoivre's Theorem. |
| 18 | Represent a vector in the form $a_i + b_j$. |
| 19 | Graph all inverse trigonometric functions. |

Course Content**Lecture/Course Content**

- I. Coordinates, graphs, and inequalities
 - A. Rectangular Coordinates
 1. Finding the equation of a circle
 2. Given the equation, finding the center and radius
 3. Finding the midpoint and length of a line segment
 - B. Graphs and functions
 1. Identifying and sketching the 6 basic graphs of mathematics
 2. Finding the x- and y- intercepts of graphs
 - C. Equations of lines
 1. Finding the equation of a line having a specified geometric relationship with a curve
 2. Finding the slope of a line through two arbitrary points on curve
 - D. Symmetry and graphs
 1. Determining analytically if a graph possesses symmetry
 2. Graphing a set of points symmetric with respect to a given axis or line
 - E. Linear inequalities and absolute value inequalities
 1. Solving compound linear inequalities
 2. Solving absolute value inequalities
 - F. Quadratic and rational equations and inequalities

1. Solving quadratic equations and inequalities
2. Solving rational inequalities
- II. Functions
 - A. Definition of a function
 1. Stating the definition of a function and determining if a relation is a function
 2. Calculating using functional notation and computing quotients of the forms
 3. Algebraically finding the domain and range of a function
 - B. Graph of a function
 1. Calculating the average rate of change of a function
 2. Graphing functions with restricted domains or piecewise functions
 3. Calculating the instantaneous rate of change of a function by making up a table of values
 4. Graphs of quadratic functions including vertex, axis of symmetry.
 5. Graphing radical, absolute, polynomial, and rational functions including horizontal, vertical, and slant asymptotes.
 6. Graphing transformations of absolute, radical, and polynomial functions.
 - C. Graphing curves using translation and reflection techniques
 - D. Combining functions
 1. Combining two functions using arithmetic operations
 2. Combining functions using composition
 3. Decomposing a function into two or more functions
 - E. Iteration (Optional)
 1. Performing iterations on a function
 2. Finding the fixed point of a function
 - F. Inverse functions
 1. Determining if two functions are inverses of each other
 2. Finding the equation of the inverse function
 3. Graphing the inverse function
 4. Applying the one-to-one concept to determine if a function has an inverse
- III. Polynomial and rational functions
 - A. Linear functions
 1. Formulating linear models to applications such as total cost, marginal cost, and depreciation
 2. Finding the equation of the regression line (optional)
 3. Computing iterations on a linear function (optional)
 - B. Graphs of quadratic functions
 1. Finding the vertex
 2. Finding the line of symmetry
 - C. Applied functions: applying function models to set up equations that optimize values for maximum/minimum problems
 - D. Graphing polynomial functions that are in factored form
 - E. Graphing rational functions that are in factored form
 - F. Solving polynomial equations with degree 3 or higher
 1. Use the Rational Root Theorem to find the zeros of a polynomial function.
 2. Characterize zeros and rational, irrational, and/or complex.
 3. Remainder and Factor Theorems
- IV. Exponential and logarithmic functions
 - A. Introduction to exponential functions and their graphs
 1. Graphing functions of the form $y = a^x$
 2. Solving simple exponential equations without using logarithms
 - B. The exponential function $y = e^x$
 1. Graphing functions of the form $y = e^x + B + C$
 2. Finding the domain, range, intercepts, and asymptote
 - C. Logarithmic functions and their properties
 1. Graphing logarithmic functions including $y = a + \ln(x - c)$
 2. Rewriting a logarithmic expression using the change-of-base formula

3. Solving exponential equations using logarithms
4. Solving logarithmic equations using exponentials
5. Finding the inverse of an exponential function
6. Finding the inverse of a logarithmic function
7. Simplifying logarithmic expressions using properties of logarithms
- V. The trigonometric functions
 - A. Radian measure
 1. Converting between degree and radian measure
 2. Solving problems involving angular speed, and arc length, and linear speed
 - B. Defining the trigonometric functions using unit circle and right triangle approaches
 - C. Simplifying expressions and calculating the trigonometric values of general angles using the reference angle concept
- VI. Graphs of trigonometric functions
 - A. Trigonometric functions of real numbers
 1. Simplifying algebraic expressions using trigonometric substitutions
 2. Calculating $\sin\theta$, $\cos\theta$, given any trigonometric functions of θ by using the Pythagorean identities
 - B. Graphing curves of the form $y = A\sin(Bx + C) + D$ and $y = A\cos(Bx + C) + D$
 - C. Graphing the tangent and reciprocal functions
 - D. Graph all trigonometric functions and their asymptotes
- VII. Analytical trigonometry
 - A. Calculating trigonometric functions of opposite angles, double angles, half-angles, and sums of angles
 - B. Solving trigonometric equations using radian and degree measure
 - C. Inverse trigonometric functions
 1. Graphing all inverse trigonometric functions and their asymptotes.
 2. Solving equations involving inverse trigonometric functions
 3. Calculating inverse trigonometric values such as $\arcsin(1/2)$
 4. Calculating composition of trigonometric function with inverse trigonometric functions
 5. Inverse trigonometric identities
- VIII. Additional topics in trigonometry
 - A. Right-triangle applications
 1. Resolving right triangles
 2. Solving application problems involving angle of elevation/depression
 3. Finding the area of a triangle using trigonometric formula
 - B. Resolving oblique triangles and solving applications using Law of Sines and Law of Cosines
 - C. Vectors in the plane, a geometric approach
 1. Calculating the sum of two vectors algebraically and illustrating the sum
 2. Calculating the horizontal and vertical components of a vector
 - D. Graphing equations given in parametric form
 - E. Polar coordinates
 1. Converting between rectangular and polar coordinates
 2. Converting equations between rectangular and polar form
 - F. Graphing polar curves
- IX. Solving systems of equations using Gaussian Elimination, determinants and matrices
 - A. Solving nonlinear system of equations
 - B. Solving systems of inequalities (Optional)
- X. Analytic geometry of conic sections
 - A. Finding the equation, sketch the conic section, and label the appropriate attributes of foci, directrix, eccentricity, vertex, and/or center for: parabola, hyperbola, ellipse, and circle
 - B. Sketching the graph of a conic section written in polar form
 - C. Rotation of axes (Optional)
- XI. Roots of polynomial equations
 - A. Solving polynomial equations using synthetic division, remainder theorem, factor theorem, and Fundamental Theorem of Algebra
 - B. Applying Descartes' Rules of Signs to equation solving (Optional)

- C. Finding the partial fraction decomposition of rational expressions
- XII. Additional topics in algebra
 - A. Using the Principle of Mathematical Induction to prove statements
 - B. Expanding a binomial using the Binomial Theorem
 - C. Finding common difference, common ratio, partial sum, general term, and infinite sum as required for arithmetic and geometric sequences and series
 - D. Finding roots of equations using DeMoivre's Theorem
- XIII. Introduction to Vectors

Laboratory or Activity Content

None

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Computational homework
 Group projects
 Individual projects
 Objective exams
 Problem-solving exams
 Quizzes
 Essays
 Problem-Solving Assignments

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Audio-visual presentations
 Class discussions
 Distance Education
 Lecture

Describe specific examples of the methods the instructor will use:

Methods may include, but are not limited to:

- A. Instructor guided discussion and instruction to assist in formulating models to solve optimization problems, analyze functions, simplify trigonometric expressions, and resolve triangles using identities.
- B. Examples demonstrated and worked out by the instructor illustrating solving equations, graph sketching, and simplifying trigonometric expressions.
- C. Instructor led computerized and/or graphing calculator demonstrations to assist in analyzing functions, to assist in sketching graphs of equations, to assist in analyzing conic sections, and to assist in generating numerical data to calculate and support algebraic statements.

Representative Course Assignments

Writing Assignments

1. Three or four sentence responses, for example: Use your own words to explain how to determine if two functions are inverses of each other.

Critical Thinking Assignments

1. Recognize the relationship between functions and their inverses graphically and algebraically.
2. Prove trigonometric identities
3. Synthesize results from the graphs and/or equations of functions and relations.
4. Identify special triangles and their related angle and side measures.

Reading Assignments

1. Critical reading and thinking in application homework problems, for example: "A rectangular package can have a maximum combined length and girth (perimeter of a cross section) of 108 inches. Find the dimensions of the package of maximum volume."

Problem-Solving and Other Assignments (if applicable)

1. Analytical problem computation or sketch sample, for example: "Determine the amplitude, period, and phase shift for the given function. Graph the function over an interval of two complete periods."

Outside Assignments**Representative Outside Assignments**

1. Students will graph functions and relations in rectangular coordinates and polar coordinates
2. Students will solve and apply equations including rational, linear, polynomial, exponential, absolute value, and logarithmic functions
3. Represent a vector in the form $a_i + b_j$
4. Student will complete assignments converting between polar and rectangular coordinates
5. Students will practice graphing all inverse trigonometric functions

Articulation**C-ID Descriptor Number**

MATH 955

Status

Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
CSU Bakersfield	MATH 1040	Precalculus I and II Combined	
San Francisco State Univeristy	MATH 199	Pre-Calculus	

Comparable Courses within the VCCCD

MATH M07 - Precalculus and Trigonometry
 MATH V19 - Precalculus & Trigonometry
 MATH V20 - Precalculus Mathematics

District General Education**A. Natural Sciences****B. Social and Behavioral Sciences****C. Humanities****D. Language and Rationality****D2. Communication/Analytical Thinking**

Approved

Date Proposed:

01/30/2019

Effective term:

Fall 2019

E. Health and Physical Education/Kinesiology**F. Ethnic Studies/Gender Studies****Course is CSU transferable**

Yes

CSU Baccalaureate List effective term:

Fall 2019

CSU GE-Breadth**Area A: English Language Communication and Critical Thinking****Area B: Scientific Inquiry and Quantitative Reasoning****B4 Mathematical/Quantitative Reasoning**

Approved

Area C: Arts and Humanities**Area D: Social Sciences****Area E: Lifelong Learning and Self-Development****Area F: Ethnic Studies****CSU Graduation Requirement in U.S. History, Constitution and American Ideals:****UC TCA****UC TCA**

Approved

Effective term:

Fall 2020

IGETC**Area 1: English Communication****Area 2A: Mathematical Concepts & Quantitative Reasoning****Area 2A: Mathematical Concepts & Quantitative Reasoning**

Approved

Effective term:

Fall 2020

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type

Textbook

Description

Pre-Calculus 11th Edition by Michael Sullivan (Pearson, 2020)

Resource Type

Other Instructional Materials

Description

Graphing calculator.

Resource Type

Other Instructional Materials

Description

Overhead graphing calculator, Texas Instruments (TI-83, TI-84, TI-85, or equivalent).

Library Resources

Sufficient Library Resources exist

Yes

Distance Education Addendum

Definitions

Distance Education Modalities

Hybrid (1%–50% online)
Hybrid (51%–99% online)
100% online

Faculty Certifications

Faculty assigned to teach Hybrid or Fully Online sections of this course will receive training in how to satisfy the Federal and state regulations governing regular effective/substantive contact for distance education. The training will include common elements in the district-supported learning management system (LMS), online teaching methods, regular effective/substantive contact, and best practices.

Yes

Faculty assigned to teach Hybrid or Fully Online sections of this course will meet with the EAC Alternate Media Specialist to ensure that the course content meets the required Federal and state accessibility standards for access by students with disabilities. Common areas for discussion include accessibility of PDF files, images, captioning of videos, Power Point presentations, math and scientific notation, and ensuring the use of style mark-up in Word documents.

Yes

Regular Effective/Substantive Contact

Hybrid (1%–50% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic on the process of finding the maximum height of a projectile, and they will respond to other classmates with the intent of dialogue.
Video Conferencing	Video tools such as ConferZoom may be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Student-to-student group meetings will also be encouraged.
Other DE (e.g., recorded lectures)	Students will watch recorded, video lectures.
E-mail	Responses to specific email questions.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic on the process of finding the maximum height of a projectile, and they will respond to other classmates with the intent of dialogue.
Other DE (e.g., recorded lectures)	Students will watch recorded, video lectures.
E-mail	Responses to specific email questions.
Video Conferencing	Video tools such as ConferZoom may be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Student-to-student group meetings will also be encouraged.

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Students will post a discussion board topic on the process of finding the maximum height of a projectile, and they will respond to other classmates with the intent of dialogue.
Video Conferencing	Video tools such as ConferZoom may be used to provide live synchronous or asynchronous sessions with students. ADA compliance will be upheld with Closed Captioning during the session or of the recorded session. Student-to-student group meetings will also be encouraged.
Other DE (e.g., recorded lectures)	Students will watch recorded, video lectures.
E-mail	Responses to specific email questions.

Examinations

Hybrid (1%–50% online) Modality

On campus
Online

Hybrid (51%–99% online) Modality

On campus
Online

Primary Minimum Qualification

MATHEMATICS

Review and Approval Dates

Department Chair

05/09/2023

Dean

05/09/2023

Technical Review

05/10/2023

Curriculum Committee

05/10/2023

DTRW-I

MM/DD/YYYY

Curriculum Committee

MM/DD/YYYY

Board

MM/DD/YYYY

CCCCO

MM/DD/YYYY

Control Number

CCC000599728

DOE/accreditation approval date

MM/DD/YYYY