

MATH M07: PRECALCULUS AND TRIGONOMETRY

Originator

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College

Moorpark College

Discipline (CB01A)

MATH - Mathematics

Course Number (CB01B)

M07

Course Title (CB02)

Precalculus and Trigonometry

Banner/Short Title

Precalculus and Trigonometry

Credit Type

Credit

Start Term

Fall 2023

Catalog Course Description

Integrates college algebra and trigonometry. Includes basic algebraic concepts, equations and inequalities of the first and second degree, systems of equations and inequalities, functions and graphs, linear and quadratic functions, polynomial functions of higher degree, rational functions, exponential and logarithmic functions, trigonometric functions, analytical trigonometry, and polar coordinates. Recommended for students planning to enter the MATH M25A/B/C sequence.

Course Credit Limitations: MC and CSU - completing MATH M05 and MATH M06 is equivalent to completing MATH M07. Students completing MATH M05, M06 and M07 receive a maximum credit of 7 units for MC and CSU.

UC Credit Limitations: MATH M05, MATH M07, and MATH M11 combined: maximum credit one course, no more than 5 semester or 7.5 quarter units.

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

Intermediate Algebra or placement as determined by the college's multiple measures assessment process.

Entrance Skills**Entrance Skills**

- graph and interpret linear and quadratic functions.
- analyze and solve various equations, inequalities, and systems of equations.

Requisite Justification**Requisite Type**

Prerequisite

Requisite

Intermediate Algebra

Requisite Description

Course in a sequence

Level of Scrutiny/Justification

Required by 4 year institution

Student Learning Outcomes (CSLOs)**Upon satisfactory completion of the course, students will be able to:**

- | | |
|---|--|
| 1 | solve a quadratic trigonometric equation. |
| 2 | graph a trigonometric function of the type $y=A \sin Bx + C$. |
| 3 | simplify a difference quotient expression. |

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 | analyze and identify the features of the graphs and/or the 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, radical, and logarithmic, and solve linear, nonlinear, and absolute value inequalities. |
| 6 | solve systems of equations and inequalities. |
| 7 | apply functions to model real world applications. |
| 8 | prove trigonometric identities. |
| 9 | identify special triangles and their related angle and side measures. |
| 10 | evaluate the trigonometric function at an angle whose measure is given in degrees and radians. |
| 11 | manipulate and simplify a trigonometric expression. |
| 12 | solve trigonometric equations, triangles, and their related applications. |
| 13 | graph the basic trigonometric functions and apply changes in period, amplitude, phase shift and vertical shift to generate new graphs. |
| 14 | evaluate and graph inverse trigonometric functions. |
| 15 | convert between polar and rectangular coordinates. |
| 16 | calculate powers and roots of complex numbers using DeMoivre's Theorem. |
| 17 | represent a vector (a quantity with magnitude and direction) in the form a_i+b_j , compute the magnitude of a vector, and graph vectors on the xy -plane. |
| 18 | perform vector operations including addition, subtraction, scalar multiplication, and dot product. Determine the angle between two vectors and when vectors are parallel or perpendicular, and compute the projection vector. |
| 19 | write the standard form of a circle given the general equation. |
| 20 | graph plane curves described by parametric equations. |
| 21 | find parametric forms for functions in the plane and eliminate the parameter given curves in parametric form. |
| 22 | work with sequences and series or use the Binomial Theorem or determine the equations of the standard conics or perform partial fraction decomposition. |

Course Content**Lecture/Course Content****10% A. Functions**

1. Definitions, evaluation, domain and range of linear, polynomial, rational, radical, exponential, absolute value, logarithmic, trigonometric
2. Inverses of functions
3. Algebra of functions

10% B. Graphs of Functions

1. Graphs of functions including asymptotic behavior, intercepts, and vertices
2. Transformations of quadratic, absolute value, radical, rational, logarithmic, and exponential functions

15% C. Equations and Inequalities

1. Equations including rational, linear, radical, polynomial, exponential, trigonometric, logarithmic, and absolute value
2. Linear, nonlinear, and absolute value inequalities
3. Systems of equations and inequalities
4. Characterization of real and complex zeros of polynomials

15% D. Trigonometric Functions

1. Rectangular coordinates, angles and circular/radian measure
2. Definitions of the six trigonometric functions according to the right triangle, the unit circle, and the rectangular coordinate system
3. Applications of the right triangle
4. Simplification of trigonometric expressions

10% E. Graphs of the Trigonometric Functions

1. Graphs of trigonometric functions: period, amplitude, phase shift, and asymptotes
2. Graphs of inverse trigonometric functions

10% F. Analytic Trigonometry

1. Proofs of trigonometric identities
2. Inverse trigonometric functions

12% G. Applications of Trigonometry

1. Solving triangles: law of sines and law of cosines
2. Polar coordinates and equations
3. DeMoivre's Theorem and applications

5% H. Vectors

1. Introduction to vectors
2. Vector operations

8% I. Additional College Algebra Topics

1. Equations and graphs of circles
2. Parametric equations

5% J. Preparation for Calculus Topics (select one of the following topics):

1. Sequences and series
2. Binomial Theorem
3. Conic sections
4. Partial fraction decomposition

Laboratory or Activity Content

n/a

Methods of Evaluation

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

Written expression
 Problem solving exercises
 Skills demonstrations

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
 Individual projects
 Objective exams
 Problem-solving exams
 Problem-solving homework
 Quizzes
 Other (specify)
 Classroom Discussion
 Projects

Other

Quizzes and graded work will be used to evaluate students for the critical thinking skills needed to solve math problems. Problems must require students to demonstrate analytic skills and the step-by-step details required for the solution.

Instructional Methodology

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

Class activities
 Class discussions
 Collaborative group work
 Demonstrations

Distance Education
 Group discussions
 Instructor-guided interpretation and analysis
 Instructor-guided use of technology
 Lecture
 Problem-solving examples
 Other (specify)

Specify other method of instruction

All instructors will use best practices to provide an inclusive learning environment that respects all forms of racial, ethnic, age, and gender diversity, and provides for the individual needs of students of all learning styles.

Describe specific examples of the methods the instructor will use:

1. Use of whiteboard or overhead projector to demonstrate solutions to calculations, such as identifying zeros, roots, domains and asymptotes of polynomial or rational functions.
2. Classroom discussion, with student response, such as discussing the application of the Law of Sines and Cosines to solve real life problems.
3. In-class group activities, such as guided practice on solving various types of trigonometric equations and proving trigonometric identities.

Representative Course Assignments

Writing Assignments

1. Short answer problems on exams, such as stating the results for an application problem indicating how much money is in an account after a certain period of time, or identifying how long it takes for some biological material to grow to a certain amount.
2. Graded assignments: in-class and/or homework assignments requiring complete solutions using both written English and symbolic mathematical language, such as indicating the sides of a general triangle, giving angle measures in both radians and degrees, and identifying sides with proper labels.
3. Written explanation of the solutions, such as indicating all features and translations of the graph of a parabola or a square root function.

Critical Thinking Assignments

1. Describe and apply the algorithmic steps for obtaining the solution to a mathematical problem, such as solving a trigonometric equation.
2. Compare and contrast methods of solution to mathematical problems, such as solving nonlinear inequalities by more than one method.
3. Apply analytic techniques for solving higher degree polynomial equations, such as applying synthetic division and the Rational Root Theorem.

Reading Assignments

1. Reading concepts from the textbook, such as the description of the differences between a relation, function and one-to-one function.
2. Reading instructor created materials, such as a prepared handout describing the meaning of intercepts, roots, turning points and asymptotes in the graphs of functions.
3. Reading resource materials from the library or online concerning real-life applications of exponents and logarithms in economics and the sciences.

Skills Demonstrations

1. Demonstration of understanding the meaning of an answer, such as interpreting the meaning of an ordered-pair answer in an application problem.
2. Demonstration of the proper use of a calculator in finding the numerical solution to an application problem involving exponents or logarithms, and expressing the answer with proper numerical rounding and proper labeling.

Problem-Solving and Other Assignments (if applicable)

1. Graded problem solving assignments, such as review sheets or unit assignments on topics, which may include algebraic computations on polynomial and rational functions, or solving for solutions of trigonometric, exponential or logarithmic equations.
2. Demonstration of computational skills such as solving a system of linear and nonlinear equations.

Outside Assignments

Representative Outside Assignments

1. Assigned homework problems selected from the textbook, such as practice sets on identifying all roots of a polynomial, or stating the domain of a rational function.
2. Assigned reading material from the college algebra and trigonometry textbook, such as viewing diagrams of the graphs of the various trigonometric functions.
3. Group or individual assignments, such as identifying and sketching graphs of polynomial, rational, exponential, logarithmic or trigonometric functions.
4. Additional problem sets provided by the instructor, such as practice exercises on simplifying trigonometric expressions and proving identities.

Articulation

C-ID Descriptor Number

MATH 955

Status

Approved

Equivalent Courses at 4 year institutions

University	Course ID	Course Title	Units
UC Santa Cruz	MATH 3	Precalculus	5
CSU Fullerton	MATH 125	Precalculus	5
UC Berkeley	MATH 32	Precalculus	4
CSU Channel Islands	MATH 105	Pre-Calculus	4

Comparable Courses within the VCCCD

MATH R117 - Precalculus and Trigonometry
 MATH V05 - Plane Trigonometry
 MATH V19 - Precalculus & Trigonometry
 MATH V20 - Precalculus Mathematics

Equivalent Courses at other CCCs

College	Course ID	Course Title	Units
Santa Barbara City College	MATH 138	Precalculus - College Algebra and Trigonometry	4
San Diego Mesa College	MATH 141	Precalculus	5
Antelope Valley College	MATH 140	Precalculus	4

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

D2. Communication/Analytical Thinking

Approved

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

Course is CSU transferable

Yes

CSU Baccalaureate List effective term:

F1995

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

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 2A: Mathematical Concepts & Quantitative Reasoning

Approved

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

Classic Textbook

No

Description

Larson, Ron. *Precalculus*. 11th ed., Cengage, 2022.

Resource Type

Textbook

Classic Textbook

No

DescriptionSullivan, Michael. *Precalculus: Concepts Through Functions, A Unit Circle Approach to Trigonometry*. 4th ed., Pearson, 2019.**Resource Type**

Textbook

Classic Textbook

No

DescriptionSchulz, Eric, Julianne Connell Sachs, and Williams L. Briggs. *Precalculus*. 2nd ed., Pearson, 2022.**Resource Type**

Textbook

DescriptionAbramson, Jay, et al. *Precalculus*. 2nd ed., E-book, OpenStax (Rice University), 2022, <https://openstax.org/details/books/prec calculus-2e>. Accessed 30 Sept 2022.**Resource Type**

Textbook

DescriptionAbrahamson, Jay, et al. *College Algebra and Trigonometry*. E-book, OpenStax (Rice University), 2021, <https://openstax.org/details/books/algebra-and-trigonometry>. Accessed 30 Sept 2022.**Library Resources****Assignments requiring library resources**

Use textbooks on reserve. Use of the Library's reference materials, print and online, to assist with completion of various application problems, such as researching interest rates, or rates of growth and decay in biological situations.

Sufficient Library Resources exist

Yes

Example of Assignments Requiring Library Resources

Using library resources to explore applications of functions and graphing, such as finding examples of structures or natural phenomena that simulate various graphs and shapes, including using measurements to compute heights, widths, areas and volumes.

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)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.
Face to Face (by student request; cannot be required)	Students requesting to speak to instructor in person for personal help on material, grade information, or discussion of policies and procedures.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.
Synchronous Dialog (e.g., online chat)	Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.

Hybrid (51%–99% online) Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.
Face to Face (by student request; cannot be required)	Students requesting to speak to instructor in person for personal help on material, grade information, or discussion of policies and procedures.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.
Synchronous Dialog (e.g., online chat)	Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.

100% online Modality:

Method of Instruction	Document typical activities or assignments for each method of instruction
Asynchronous Dialog (e.g., discussion board)	Use of student discussion boards to discuss concepts from the material, solutions to homework problems, general discussion of techniques in solving problems, study skills, or arranging study groups.
E-mail	Responding to student queries about material, grade information, course policies and procedures, scheduling and due dates, submitting homework assignments, or making general announcements to the class.
Face to Face (by student request; cannot be required)	Students requesting to speak to instructor in person for personal help on material, grade information, or discussion of policies and procedures.
Other DE (e.g., recorded lectures)	Posting of recorded lectures either by the instructor, recorded lessons available through campus resources, or use of public online resources available on the internet.

Synchronous Dialog (e.g., online chat)

Active live discussion with the instructor on material concepts, techniques for problem solving, feedback on solutions to problems, general chat on study skills, or answers to homework problems, quizzes or tests.

Examinations

Hybrid (1%–50% online) Modality

On campus

Hybrid (51%–99% online) Modality

On campus

Primary Minimum Qualification

MATHEMATICS

Review and Approval Dates

Department Chair

10/14/2022

Dean

10/17/2022

Technical Review

10/20/2022

Curriculum Committee

11/01/2022

DTRW-I

MM/DD/YYYY

Curriculum Committee

MM/DD/YYYY

Board

MM/DD/YYYY

CCCCO

MM/DD/YYYY

Control Number

CCC000562628

DOE/accreditation approval date

MM/DD/YYYY