

MATH 0029 - PRE-CALCULUS MATHEMATICS

SECTION A

- | | |
|--|--------------------------|
| 1. Division: | Sciences & Mathematics |
| 2. Course Discipline: | MATH |
| 3. Course Number: | 0029 |
| 4. Course Title: | PRE-CALCULUS MATHEMATICS |
| 5. First semester this new version/new course will be offered: | FALL 2013 |

SECTION B General Course Information

- | | | | |
|-------------------|---|-----------------|-----|
| 1.Units: | 4.0 | Variable Units: | N/A |
| 2.This Course is: | Degree-Applicable Credit - Transferable | | |
| 3A. Cross-List: | | 3B. Formerly: | |

Course Format and Duration

- | 4. Standard Term Hours per Week | | 5. Standard Term Total Semester Hours | |
|---------------------------------|----------|---------------------------------------|-----------|
| Lecture/Discussion: | 4 | Lecture/Discussion: | 72 |
| Lab: | | Lab: | |
| Activity: | | Activity: | |
| By Arrangement: | | By Arrangement: | |
| Total Hours per Week: | 4 | Total Hours : | 72 |
6. Minimum hours per week of independent work done outside the class: 8

Course Preparation - (Supplemental form B required)

7a. Prerequisite(s): (Course and/or other preparation/experience that is **REQUIRED** to be completed previous to enrollment in this course.)

Completion of MATH 8 with grade of "C" or better, or placement by matriculation assessment process

7b. Co-requisite(s): (Courses and/or other preparation that is **REQUIRED** to be taken concurrently with this course.)

7c. Advisory: (MINIMUM preparation **RECOMMENDED** in order to be succesful in this course. Also known as "Course Advisory".)

Catalog Description And Other Catalog Information:

8. Repeatability: Not Repeatable

Please note: Repeatability does not refer to repeating courses because of substandard grades or a lapse of time since the student took the course. A course may be repeated only if the course content differs each time it is offered and the student who repeats it is gaining an expanded educational experience as stipulated in Title V.

- Skills or proficiencies are enhanced by supervised repetition and practice within class periods.
- Active participatory experience in individual study or group assignments is the basic means by which learning objectives are attained.
- Course content differs each time it is offered.

Explanation for above repeatability selection:

9a. Grading Option: Standard Grade

9b. Catalog Description:

Preparation for calculus. Study of polynomials, rational functions, exponential and logarithmic functions, trigonometric functions, systems of linear equations, matrices, determinants, rectangular and polar coordinates, conic sections, complex number systems, mathematical induction, binomial theorem, and sequences. Recommended for students who plan to take MATH 30.

Course Outline Information

10. Course Objectives: (Performance objectives for all credit courses must indicate that students will learn critical thinking and will be able to apply concepts at college level. Performance objectives must be related to items listed in Section 11.)

Through homework assignments, quizzes, exams, projects and classroom discussions, the student will:

1. solve equations, including polynomial, radical, quadratic in form, rational, logarithmic, exponential, and literal with real and imaginary solutions;
2. solve rational, polynomial, and absolute value inequalities;
3. graph polynomial, rational, logarithmic, exponential, and radical functions and find any intercepts, extrema, or asymptotes;
4. solve word problems leading to equations from objectives #1, 2, and 3;
5. solve systems of equations or inequalities using substitution, elimination, graphing Cramer's Rule, and matrices;
6. perform binomial expansion using Pascal's Triangle or combinatorics;
7. identify terms and find finite or infinite sums of arithmetic and geometric sequences and series;
8. apply "Mathematical Induction" method of proof to appropriate problems;
9. evaluate the six trigonometric functions of special angles and their inverses;
10. graph basic trigonometric functions and their transformations and have the ability to identify extreme values, zeros, period, asymptotes and transformations;
11. verify trigonometric identities using valid substitutions and algebraic manipulations;
12. generate solutions to trigonometric equations including the use of trigonometric identities;
13. solve right and oblique triangles and related applications;
14. use polar coordinate system to graph polar equations and evaluate roots and powers of complex numbers;
15. analyze and graph conic sections in rectangular and polar form, labeling the center, vertices, foci, directrices, and asymptotes when applicable;
16. sketch parametric curves and convert parametric equations into rectangular form.

11. Course Content Outline: (Provides a comprehensive, sequential outline of the course content, including all major subject matter and the specific body of knowledge covered.)

I. Algebra Review

- A. Polynomial, Radical, quadratic in form, rational, and literal equations with real and imaginary solutions
- B. Nonlinear and absolute value inequalities
- C. Applications of problems from parts A and B.

II. Functions and Graphs

- A. Definition of Function and Evaluation of Functions
- B. Graphing of Functions
 - 1. Zeros, or Roots, and Intercepts of Functions
 - 2. Asymptotes of Functions
 - 3. Shifting and Reflection of Functions
 - 4. Symmetry
- C. Inverse Functions

III. Exponential and Logarithmic Functions

- A. Solving Equations with Exponentials and Logarithms
- B. Graphing Exponential and Logarithmic Functions
- C. Word Problems with Logarithmic and Exponential Equations

IV. Systems of Equations and Matrices

- A. Solving Systems of Equations
 - 1. Substitution
 - 2. Elimination
- B. Introduction to Matrices
 - 1. Algebra of matrices
 - 2. Elementary row operations
 - 3. Inverse of a square matrix
- C. Matrices as a Method of Solving a System of Equations
 - 1. Elementary row operations
 - 2. Inverse matrices
 - 3. Cramer's Rule

V. Binomial Expansion

- A. Pascal's triangle
- B. Binomial Theorem

VI. Sequences and Mathematical Induction

- A. Arithmetic Sequences
 - 1. Terms
 - 2. Sums
- B. Geometric Sequences
 - 1. Terms
 - 2. Sums (finite and infinite)
- C. Introduction to Mathematical Induction

VII. Basic Trigonometric Functions

- A. Graphing Trigonometric Functions
- B. Trigonometric Identities
 - 1. Verify Identities
 - 2. Reciprocal, Ratio, Pythagorean, Sum, Difference, Double Angle, Half Angle
- C. Application Problems

VIII. Analytic Trigonometry

- A. Inverse Trigonometric Functions
- B. Solving Trigonometric Equations
- C. Right and Oblique Triangles

IX. Polar Coordinates and DeMoivre's Theorem

- A. Polar Coordinates
- B. Graphs of Polar Equations

- C. Polar Form of Complex Numbers
- D. DeMoivre's Theorem

X. More Graphs

A. Conic sections

1. Graphs of conic sections and their transformations in Cartesian coordinates
2. Polar form of conic sections

B. Parametric Equations and Graphs

12. Typical Out-of-Class Assignments: (Credit courses **require** two hours of independent work outside of class for each lecture hour, less lab/activity classes. List type of assignments including library assignments.)

a. Reading Assignments: (Submit at least 2 examples.)

1. In the text read about real world applications of parabolas. Note the significance of the placement of the focus and the importance of the length of the focal diameter.
2. In the text read about solving triangles using the Law of Cosines and Law of Sines. Be sure you can distinguish when to appropriately use one or the other.

b. Writing, Problem Solving or Performance: (Submit at least 2 examples)

1. Find all zeros for a given 5th degree polynomial using the Rational Zeros Theorem, synthetic division, and other relevant theorems. Use your results to sketch a graph of the function.
2. After the release of radioactive material into the atmosphere from a nuclear power plant at Chernobyl (Ukraine) in 1986, the hay in Austria was contaminated by iodine 131 (half-life 8 days). If it is safe to feed the hay to cows when 10% of the iodine 131 remains, how long did the farmers need to wait to use the hay?

c. Other (Term projects, research papers, portfolios, etc.)

13. Required Materials:

a. All textbooks, resources and other materials used in this course are college level?

- Yes
 No

b. Representative college-level textbooks (for degree applicable courses) or other print materials:

Book 1:

Author: James Stewart
Title: Precalculus
Publisher: Brooks/Cole
Date of Publication: 2012
Edition: 6th edition

c. Other materials and/or supplies required of students:

Methods of Instruction

14. Check all instructional methods used to present course content:

- | | |
|--|--|
| <input checked="" type="checkbox"/> Lecture | <input checked="" type="checkbox"/> Activity |
| <input checked="" type="checkbox"/> Discussion Seminar | <input type="checkbox"/> Distance Education (requires supplemental form) |
| <input type="checkbox"/> Lab | <input type="checkbox"/> Work Experience |
| <input checked="" type="checkbox"/> Directed Study | <input type="checkbox"/> Tutoring |

Other:

Give detailed examples of teaching methodology that relate to the course performance objectives:

Example 1-In class, small group collaborative learning activity - students will discuss the strategies for sketching graphs of rational functions. This discussion should include methods for finding all vertical, horizontal, and slant asymptotes, as well as finding all intercepts of the graph. The instructor will circulate and ask clarifying questions as the students complete this task.

Example 2-Interactive lecture format is used to develop the concept of sequences. To help students understand the commonalities and differences between arithmetic and geometric sequences, the instructor will illustrate the concepts both graphically and algebraically. Students will participate verbally and will work several examples.

15. Methods of Assessing Student Learning

15a. Methods of Evaluation:

- | | |
|--|--|
| <input type="checkbox"/> Essay Exam | <input type="checkbox"/> Reports |
| <input checked="" type="checkbox"/> Objective Exam | <input checked="" type="checkbox"/> Problem Solving Exam |
| <input checked="" type="checkbox"/> Projects | <input type="checkbox"/> Skill Demonstration |
| <input type="checkbox"/> Class Discussion | <input type="checkbox"/> Other |

15b. (All courses must provide for measurement of student performance in terms of stated student performance objectives, Area 10, and culminate in a formal recorded grade based on uniform standards. Submit at least 2 examples.)

Example 1: Given the base graph $y = \sin x$, use complete sentences to describe the transformations needed to create the graph of $y = 4 - 3\sin(2x - \pi)$. This question is graded based on the use of appropriate mathematical vocabulary, and order and accuracy of the stated transformations.

Example 2: Solve a system of equations by using the inverse of a matrix. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found.

SECTION C

1. Program Information:

- In an approved program
- Part of a new program
- Not part of an approved program

2. TOP Code Information

Program Title: Mathematics, General 170100

3. Course SAM Code:

- A - Apprenticeship Course
- B - Advanced Occupational
- C - Clearly Occupational
- D - Possibly Occupational
- E - Non-Occupational

4. Faculty Discipline Assignment(s):

Mathematics

Comments:

SECTION D

General Education Information:

1. College Associate Degree GE Applicability:

Communication & Analytic Thinking

2. CSU GE Applicability:

B-4 Mathematics/Quantitative Reasoning

3. IGETC Applicability:

2: Mathematical Concepts & Quantitative Reasoning

4. C-ID :

SECTION E

1. Articulation Information: (Required for Transferable Courses Only)

- CSU Transferable
- UC Transferable
- CSU/UC Major Requirement.

If CSU/UC major requirement, list campus and major. (Note: Must be lower division)

2. List at least one community college and its comparable course. If requesting CSU and/or UC transferability also list a CSU/UC campus and comparable lower division course

American River College: MATH 370 Pre-Calculus Mathematics

CSU Chico: MATH 119 Precalculus Mathematics

UC Davis: MATH 12 Precalculus

SECTION F

Planning and Resources: Please address the areas below:

1. Evidence of Need or Potential: recommendations of advisory committee, connection to existing or planned degrees/certificates, or regional/national developments, transfer university requirements.

One of the possible prerequisites for the calculus series for math, science, and engineering majors.

2. Appropriateness to Mission: connection to basic skills, transfer, career technical education, or lifelong learning; relationship to transfer-level mathematics class.

3. Place in Program/Department: relationship to student learning outcomes identified by program, connection to general education, or articulation with other institutions.

Meets GE applicability for Math Competency and Communication and Analytical Thinking. Course includes all four Math program SLO's (Equations and Expressions, Visual Models, Applied Problems, and Communication.)

4. Availability of Faculty and Facilities: minimum qualifications to teach course, special training for instructors, or long-term physical impact of course.

All math faculty members meet the minimum qualifications to teach this course. No special training is required.

5. Potential Impact on Resources: impact on library, computer support, transportation, equipment, or other needs

No additional resources are needed since we have the classroom space and technology already available.

SECTION G

1. Maximum Class Size (recommended): 35

2. If recommended class size is not standard, then provide rationale: