

**FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT**

**Course Outline  
Pre-Calculus**

**Date:** April 2004

**Proposed Grade Level(s):** 8-12

**Grading:** A-F

**Prerequisites:** 'C' or better in Algebra 2

**Subject Area:** Mathematics

**Course Length:** 1 Year

**Number of Credits:** 5/Semester

**BRIEF COURSE DESCRIPTION:**

Pre-calculus covers many of the same topics as Algebra 2 such as solving and graphing polynomial, rationally, radical, exponential, and logarithmic functions, but in greater depth. It also expands upon the basic trigonometry first introduced in geometry, but includes graphing trig functions, proving identities as well as applying trigonometry with the Law of Sines, Law of Cosines, and finding the area of a triangle. Topics such as conic equations and sequences and series, first introduced in Algebra 2, are studied in much greater depth in the Pre-calculus course. Polar coordinates and graphs of polar equations, introduction to vectors, and some basic ideas regarding limits are also introduced in this course.

**GENERAL GOALS/PURPOSES:**

The purpose of this course is to bridge abstract thinking skills, the function concept, and the algebraic solution of problems in various content areas presented in Algebra 2 and develop them further to prepare students for calculus. In addition to the math analysis content taught, the graphing, solving, and applications of trigonometry are taught in preparation of their use in calculus as well as other advanced science and math courses.

**STUDENT READING COMPONENT:**

Students will receive instruction on the effective use of their textbook. Pre-calculus includes many applications where effective reading and analysis are taught as part of the course.

**STUDENT WRITING/ORAL COMPONENT:**

Students will have opportunities to express their understanding of concepts in writing as well as present work orally to the class. All written work will follow standard rules of English. Any research projects will follow MLA format, which has been distributed at all secondary sites.

**Final Assessment:**

There is no district final for this course. However, each high school has a departmental final for both the first and second semesters.

## DETAILED UNITS OF INSTRUCTION:

**Note:** The California Mathematics Content Standards for Algebra 2 and other advanced math topics prior to calculus are handled differently at every school in the state. The state standards for Pre-calculus include standards from under the headings of “Trigonometry”, “Mathematical Analysis”, “Linear Algebra”, and “Probability and Statistics”.

**Text info:** Each school uses a different text, which develops the material in slightly different orders. The table below summarizes where the detailed units of instruction are to be found in each text:

**CHS: Adv. Mathematical Concepts; Glencoe/McGraw Hill**

**FHS: Advanced Mathematics, A Pre-calculus Approach; Prentice Hall**

| <b>Topic</b>                              | <b>CHS:</b> | <b>FHS:</b> |
|---|-------------|-------------|
| Linear Relations and Functions            | 1           | 1           |
| Solving and Graphing Additional Functions | 3 & 4       | 2 & 7       |
| Systems of equations and Inequalities     | 2           | 8 & 12      |
| Trigonometric Functions and Applications  | 5 & 7       | 3 & 5       |
| Graphs and Inverses of Trig Functions     | 6           | 4           |
| Polar Coordinates and Complex Numbers     | 9           | 10          |
| Exponential and Logarithmic Functions     | 11          | 9           |
| Conics                                    | 10          | 11          |
| Vectors                                   | 8           | 12          |
| Sequences and Series                      | 12          | 13          |
| Probability                               | 14          | 15          |
| Statistics and Data Analysis              | 15          | 15          |
| Introduction to Calculus                  | 16          | 16          |

### Topics – detailed:

- Linear Relations and Functions
  - Relations and Functions
  - Real Numbers and the Cartesian Plane
  - Algebra of Functions
    - Composite functions
    - Inverse of a function
  - Linear Functions
  - Absolute Values Functions
  - Greatest Integer Functions
  - Piecewise Functions
- Solving and Graphing Additional Functions
  - Quadratic
    - Equations and Inequalities
    - Number and nature of roots/Determinate
  - Polynomial
    - Remainder Theorem and Factor Theorem
    - Integral and Rational Zeros
    - Fundamental Theorem of Algebra
    - Descartes’ Rule of Signs
    - Intermediate Value Theorem
    - Sum and Product of Roots

- Rational
  - Rational Equations and Partial Fractions
- Radical
  - Equations and Inequalities
- Systems of Equations and Inequalities
  - Solving by graphing
  - Solving using algebraic methods
  - Matrix operations
  - Determinants
  - Solving using inverse matrices
  - Augmented matrices
  - Matrices and transformations
  - Linear Programming
- Trigonometric Functions and Applications
  - Angles
    - Degrees and Radians
  - Circular Functions
  - Trigonometric Functions
  - Evaluating Trig Functions
    - Special Angles
  - Identities
    - Sum and Difference
    - Double and Half Angle
    - Product and Sum
    - Proving identities
  - Applications
    - Law of Sines
      - Ambiguous Case
    - Law of Cosines
    - Area of Triangle
- Graphs and Inverses of Trig Functions
  - Graphs of basic functions
    - Period
    - Amp
    - Phase shift
  - Inverse functions
  - Simple harmonic motion
- Polar Coordinates and Complex Numbers
  - Polar coordinates
  - Graphs of polar
  - Polar form of complex numbers
  - Product and quotient of complex numbers in polar form
  - Powers and roots of complex numbers in polar form
- Exponential and Logarithmic Functions
  - Rational exponents
  - Exponential functions
  - Logarithmic functions
  - Properties of logs
  - Common logs

- Natural logs
- Exponential and logarithmic equations
- Exponential growth and decay models
- Conics
  - Algebraic forms, vocabulary, and graphs
    - Circle
    - Ellipse
    - Hyperbola
    - Parabola
    - Degenerate Cases
  - Translation of axes
  - General Form
  - Systems of 2<sup>nd</sup> degree equations and inequalities
  - Tangents and normals to the conic section
- Vectors
  - Geometry of vectors
  - Algebraic properties of vectors
  - Vectors in space
  - Vectors and parametric equations
  - Parallel and perpendicular vectors in the plane
- Sequences and Series
  - Arithmetic sequences and series
  - Geometric sequences and series
  - Infinite sequences and series
    - Convergent and divergent series
    - Limits
  - Mathematical Induction
    - Sigma notation and the n<sup>th</sup> term
  - Binomial Theorem
- Probability (as time allows)
  - Counting principle
  - Permutations and combinations
  - Probability
    - Conditional probability
    - Binomial probability
- Statistics and Data Analysis (as time allows)
  - Measures of central tendency
  - Measures of variation
  - Frequency distributions
  - Normal distribution
- Introduction to Calculus (as time allows)
  - Limits
  - Basic derivatives and differentiation techniques
  - Tangent to a curve
  - Area under a curve
  - Fundamental Theorem of Calculus

**THIS COURSE WILL PREPARE STUDENTS FOR THE HSEE AND/OR FCUSD EXIT EXAM IN:**

**Math**

**LAB FEE, IF REQUIRED:** None

**SUBJECT AREA CONTENT STANDARDS TO BE ADDRESSED:**

Please see “Detailed Units of Instruction”

**DISTRICT ESLRs TO BE ADDRESSED:**

When students exit a secondary mathematics course, they will be:

- **Self-directed Learners** who will be able to use notes and a textbook to assist them in continuing to learn outside of the classroom setting.
- **Efficient Communicators** who can explain mathematical concepts to others and use mathematics to organize and explain data.
- **Quality Producers** who understand the importance of neat, organized work that demonstrates their thinking and understanding of the solution they’ve formed to solve a problem.
- **Constructive Thinkers** who are able to attack problems with organization, logic, and mathematical skills they’ve developed in a systematic fashion.
- **Collaborative Workers** who can work in a variety of settings in culturally diverse groups. They will be able to form and use study groups to strengthen their own understanding in addition to providing the same service for classmates.
- **Responsible Citizens** who accept the consequences of their actions and who demonstrate understanding of their role in the learning process.