

**MT. DIABLO UNIFIED SCHOOL DISTRICT
COURSE OF STUDY
DRAFT**

COURSE TITLE:	Algebra II/ Trigonometry
COURSE NUMBER:	1340
CALPADS NUMBER:	2408
CST:	Algebra II
DEPARTMENT:	High School Mathematics
NCLB CREDENTIAL REQUIREMENT:	Math Credential with Subject Matter Proficiency
LENGTH OF COURSE:	One Year
CREDITS PER SEMESTER:	5
GRADE LEVEL(S):	10-12
REQUIRED OR ELECTIVE:	This course fulfills one year of the high school mathematics requirement and UC/CSU “c” requirement.
PREREQUISITES:	Successful completion of Geometry with a C or better.

BOARD OF EDUCATION ADOPTION:

COURSE DESCRIPTION:

This course provides the student with the knowledge, concepts, skills identified in the California State Math Standards for Algebra II and Trigonometry. The ability to communicate mathematical reasoning and understanding will be incorporated into all topics. In addition, students will develop their ability to construct formal, logical arguments in algebraic and trigonometric settings and problems. This course is the third course in the three-year mathematics requirement for four-year college admission.

COURSE OUTLINE:

1. MAJOR GOALS

- 1.1 To develop the ability to reason logically and think symbolically
- 1.2 To develop skills for communicating mathematically
- 1.3 To build algebraic and trigonometric models, formulate and solve problems
- 1.4 To improve the skills necessary to be successful in multiple careers

2. PERFORMANCE OBJECTIVES:

(numbers in parentheses refers to an appropriate California State Standard)

- 2.1 Algebra II

- 2.1.1 Solve equations and inequalities involving absolute value. (Algebra II, 1.0)
- 2.1.2 Solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices. (Algebra II, 2.0)
- 2.1.3 Operations on polynomials, including long division. (Algebra II, 3.0)
- 2.1.4 Factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes. (Algebra II, 4.0)
- 2.1.5 Demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane. (Algebra II, 5.0)
- 2.1.6 Add, subtract, multiply, and divide complex numbers. (Algebra II, 6.0)
- 2.1.7 Add, subtract, multiply, divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator. (Algebra II, 7.0)
- 2.1.8 Solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Application of these techniques in solving word problems. Solving quadratic equations in the complex number system. (Algebra II, 8.0)
- 2.1.9 Demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is determination of how the graph of a parabola changes as a , b , and c vary in the equation $y = a(x-b)^2$. (Algebra II, 9.0)
- 2.1.10 Graphing quadratic functions and determines the maxima, minima, and zeros of the function. (Algebra II, 10.0)
- 2.1.11 Prove simple laws of logarithms. (Algebra II, 11.0)
- 2.1.12 Understanding of the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. (Algebra II, 11.1)
- 2.1.13 Judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step. (Algebra II, 11.2)
- 2.1.14 Knowledge of the laws of fractional exponents, exponential functions and the use of these functions in problems involving exponential growth and decay. (Algebra II, 12.0)
- 2.1.15 Use the definition of logarithms to translate between logarithms in any base. (Algebra II, 13.0)
- 2.1.16 Understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values. (Algebra II, 14.0)
- 2.1.17 Determine whether a specific algebraic statement involving rational

- expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true, or never true. (Algebra II, 15.0)
- 2.1.18 Demonstration and explanation of how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it. (Algebra II, 16.0)
- 2.1.19 Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, demonstration of knowledge of the method of completing the square in order to put the equation into standard form and recognition of whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Graphing of the equation. (Algebra II, 17.0)
- 2.1.20 Demonstration of fundamental counting principles to compute combinations and permutations. (Algebra II, 18.0)
- 2.1.21 Demonstration of computing probabilities by using combinations and permutations. (Algebra II, 19.0)
- 2.1.22 Knowledge of the binomial theorem and usage of it to expand binomial expressions that are raised to positive integer powers. (Algebra II, 20.0)
- 2.1.23 Application of the method of mathematical induction to prove general statements about the positive integers. (Algebra II, 21.0)
- 2.1.24 Finding the general term and the sums of arithmetic series and of both finite and infinite geometric series. (Algebra II, 22.0)
- 2.1.25 Derivation of the summation formulas for arithmetic series and for both finite and infinite geometric series. (Algebra II, 23.0)
- 2.1.26 Solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions. (Algebra II, 24.0)
- 2.1.27 Use of properties from number systems to justify steps in combining and simplifying functions. (Algebra II, 25.0)

2.2 Trigonometry

- 2.2.1 Understand the notion of angle and how to measure it, in both degrees and radians. Conversion between degrees and radians. (Trigonometry, 1.0)
- 2.2.2 Knowledge of the definition of sine and cosine as y - and x -coordinates of points on the unit circle and are familiar with the graphs of the sine and cosine functions. (Trigonometry, 2.0)
- 2.2.3 Knowledge of the identity $\cos^2(x) + \sin^2(x) = 1$. (Trigonometry, 3.0)
- 2.2.4 Prove that this identity, $\cos^2(x) + \sin^2(x) = 1$, is equivalent to the Pythagorean Theorem (i.e. Prove this identity by using the Pythagorean Theorem and, conversely, prove the Pythagorean Theorem as a consequence of this identity). (Trigonometry, 3.1)

- 2.2.5 Prove other trigonometric identities and simplify others by using the identity $\cos^2(x) + \sin^2(x) = 1$. For example, using this identity to prove that $\sec^2(x) = \tan^2(x) + 1$. (Trigonometry, 3.2)
- 2.2.6 Graph functions of the form $f(t) = A \sin(Bt + C)$ or $f(t) = A \cos(Bt + C)$ and interpret A , B , and C in terms of amplitude, frequency, period, and phase shift. (Trigonometry, 4.0)
- 2.2.7 Knowledge of the definitions of the tangent and cotangent functions and can graph them. (Trigonometry, 5.0)
- 2.2.8 Knowledge of the definitions of the secant and cosecant functions and can graph them. (Trigonometry, 6.0)
- 2.2.9 Knowledge of tangents and that the tangent of an angle that a line makes with the x -axis is equal to the slope of the line. (Trigonometry, 7.0)
- 2.2.10 Knowledge of the definitions of the inverse trigonometric functions and graphing of the functions. (Trigonometry, 8.0)
- 2.2.11 Computation, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points. (Trigonometry, 9.0)
- 2.2.12 Demonstration of an understanding of the addition formulas for sines and cosines and their proofs and can use those formulas to prove and/or simplify other trigonometric identities. (Trigonometry, 10.0)
- 2.2.13 Demonstration of an understanding of half-angle and double-angle formulas for sines and cosines and can use those formulas to prove and/or simplify other trigonometric identities. (Trigonometry, 11.0)
- 2.2.14 Use trigonometry to determine unknown sides or angles in right triangles. (Trigonometry, 12.0)
- 2.2.15 Knowledge of the laws of sines and the law of cosines and application of those laws to solve problems. (Trigonometry, 13.0)
- 2.2.16 Determination of the area of a triangle, given one angle and the two adjacent sides. (Trigonometry, 14.0)
- 2.2.17 Ability to use trigonometry in a variety of applications and word problems. (Trigonometry, 19.0)

3. CONTENT OUTLINE:

(numbers in parentheses refer to appropriate performance objectives)

3.1 Algebra II

- 3.1.1 Equations or inequalities and systems of equations or inequalities including career applications (2.1.1, 2.1.2)
- 3.1.2 Polynomials, complex numbers, and rational expressions (2.1.3-2.1.8, 2.1.17)
- 3.1.3 Quadratic formula, completing the square and quadratic functions (2.1.8-2.1.10, 2.1.18, 2.1.19)
- 3.1.4 Logarithms with career applications (2.1.11-2.1.13, 2.1.15-2.1.16, 2.1.17)

- 3.1.5 Fractional exponents (2.1.14)
- 3.1.6 Conic Sections (2.1.16)
- 3.1.7 Combinations and permutations (2.1.20-2.1.21)
- 3.1.8 Binomial theorem (2.1.22)
- 3.1.9 Mathematical induction (2.1.23)
- 3.1.10 Algebraic and geometric series (2.1.24-2.1.25)
- 3.1.11 Functions (2.1.26-2.1.27)

3.2 Trigonometry

- 3.2.1 Angles in degrees and radians (2.2.1)
- 3.2.2 Sine, cosine, tangent, cotangent, secant and cosecant functions (2.2.2, 2.2.6, 2.2.7-2.2.9, 2.2.12-2.2.13)
- 3.2.3 Trigonometric identities (2.2.3-2.2.5)
- 3.2.4 Inverse trigonometric functions (2.2.10-2.2.11)
- 3.2.5 Trigonometry in triangles (2.2.14, 2.1.16)
- 3.2.6 Law of cosines and Law of sines (2.2.15)
- 3.2.7 Mathematical induction (2.1.23)
- 3.2.8 Applications and word problems with **career** emphasis (2.2.21)

4. TIME ESTIMATES:

- 4.1 Instructional sequences vary in length from a few days to several weeks.

5. INSTRUCTIONAL MATERIALS:

- 5.1 District adopted textbooks
- 5.2 Supplementary and teacher-created materials that include a career focus
- 5.3 Technology materials

6. EVALUATION OF STUDENT PROGRESS:

Students communicate mathematically and demonstrate content knowledge in a variety of ways that lead to mathematical competence in their chosen careers.

- 6.1 Teacher observation
- 6.2 Written assignments and projects
- 6.3 Quizzes and tests
- 6.4 Rubrics

Committee Members:

Frank Bruketta	CVHS
Danielle Dell	CVHS
Susan Seeley	CVHS
Bodhi Young	CVHS
Suzette Blanke	CPHS
Robert Lovelace	CPHS
Angel Niedzielski	CPHS

Norma Meyerkorth	CHS
Brianne Whiteside	CHS
Kathleen Magana	MDHS
Steve Sankey	MDHS
Judith Cubillo	NHS
Ellen Dill	NHS
Rianne Pfaltzgraff	NHS
Leslie Addiego	YVHS
Mary Ditkof	YVHS
Kelly Donlon	YVHS
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Sharon Simone	RMS
Sandy Bruketta	Curriculum Specialist (Curriculum & Instruction)