Trigonometry and Analysis

Mathematics

Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course

Course Overview

GENERAL DESCRIPTION: This course is for mastery of algebra, trigonometry and the introduction of elements of advanced mathematics. This course is designed for the college bound student. The class will integrate technology and mathematics through the graphing calculutor.

TESTS: Each unit or chapter will be followed by a test, approximately four per semester.

Scope And Sequence

Timeframe	Unit	Instructional Topics
6 Week(s)	Equations, Inequalties, Functions	1. Basic Equations (1.1) 2. Modeling with Equations (1.2) 3. Quadratic Equations (1.3) 4. Complex Numbers 5. Advanced Equations (1.5) 6. Inequalities (1.6) 7. Absolute Value (1.7)
3 Week(s)	Functions	1. What is a function, graphs of functions and getting information from a function 2. Average rate of Change of a function 3. Transforming and combining functions 4. Inverse Functions
5 Week(s)	Exponential and Logarithmic Functions	1. Exponential Functions 2. The Natural Exponential 3. Logarithmic Functions 4. Laws of Logarithms 5. Exponential and Logarithmic Equations 6. Modeling and Exponential and Logarithmic Functions
4 Week(s)	Trigonometry Functions: Right Triangle Approach	1. Angle Measure 2. Trigonometry of Right Triangle 3. Trigonometric Functions of Angles 4. Inverse of Trigonometric Functions and Triangles 5. The Laws of Sines 6. The Law of Cosines
5 Week(s)	Trigonometric Functions: Unit Circle Approach	1. The Unit Circle 2. Trigonometric Functions of Real Numbers 3. Trigonometric Graphs 4. More Trigonometric Graphs 5. Inverse Trigonometry and Graphs 6. Modeling Harmonic Motions
4 Week(s)	Analytic Trigonometry	1. Trigonometric Identities 2. Additions and Subtraction Formulas 3. Double-Angle, Half-Angle and Product-Sum Formula 4. Basic Trigonometric Equations 5. More Trigonometric Equations
4 Week(s)	Polar Coordinates and Parametric Equations	1. Polar Coordinates 2. Graphs of Polar Equations 3. Polar Forms of Complex Numbers:
5 Week(s)	Sequences and Series	1. Sequences and Summation Notation 2. Arithmeteic Sequences 3. Geometric Sequences 4. Mathematics of Finance 5. The Binomial Theorem
4 Week(s)	Vectors in Two and Three Dimensions	1. Vectors in Two Dimensions 2. The Dot Product 3. Vectors in Three Dimensions 4. The Cross Product

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Materials and Resources

SUPPLIES: Each student will be charged a $5 calculator rental feel, unless the student chooses to purchase the calculator required for the class. The minimum of a TI-83 need to be used.

Algebra and Trigonometry 3rd Edition - Stewart

Prerequisites

PREREQUISITE: Geometry and Algebra II. Sophomores wishing to enroll must have instructor approval.

Course Details

Unit: Equations, Inequalties, Functions

Duration: 6 Week(s)

Unit Overview

Review of all equations studies in algebra with emphasis on problem solving, modeling and calculator usage.

Academic Vocabulary

Factoring
Inverse
Recripocal
Opposite
Rational
Irrational
LCD
Quadratic Formula
Imaginary Numbers
Complex Numbers
Extraneous Solutions
Zeros
Solutions
Roots
Absolute Value
Piecewise Function
Slope
Average Rate of Change
Function
Domain
Range
Composition of Functions
One to One Function
Inverse Function

Topic: Basic Equations (1.1)

Duration: 2 Day(s)

Topic Overview

Linear Equations
Rational Equation
Power Equations
Implicit Equations

Learning Targets

Basic Equations

Solving Linear Equations, Solving power equations, solving for one variable in terms of the other.

Topic: Modeling with Equations (1.2)

Duration: 3 Day(s)

Topic Overview

Interest
Area and Length
Mixture Problems
Time Problems
Distance,rate,time
work problems

Learning Targets

Making and Using Models

Interest, area, mixtures, Distance/rate/time

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Topic: Quadratic Equations (1.3) **Duration:** 1 Day(s)

Topic Overview
- Completing the square
- Factoring
- Quadratic Formula
- Graphing Solutions

Learning Targets
- Solving Quadratic Equations
  - Factoring, complete the square and quadratic formula

Topic: Complex Numbers **Duration:** 1 Day(s)

Topic Overview
- Operations
- Simplification

Learning Targets
- Complex Numbers
  - Arithmetic operations, definitions and roots of polynomials

Topic: Advanced Equations (1.5) **Duration:** 1 Day(s)

Topic Overview
- Radical Equations
- Fractional Power/Advanced Factoring
- Rational Equations

Learning Targets
- Other types of equations
  - polynomial, radical, fractional powers

Topic: Inequalities (1.6) **Duration:** 1 Day(s)

Topic Overview
- Linear Inequalities
- Nonlinear Inequalties

Learning Targets
- Inequalities
  - Solving, linear and nonlinear, modeling

Topic: Absolute Value (1.7) **Duration:** 1 Day(s)

Topic Overview
- Equations and Inequalities
- Graphical Solutions

Learning Targets
- Equations and inequalities
  - Equations and Inequalities

Unit: Functions

Duration: 3 Week(s)

Unit Overview

Mathematical elements of a function

Topic: What is a function, graphs of functions and getting information from a function **Duration:** 3 Day(s)

Learning Targets
Function Notation. Domain of Functions, Evaluations of functions

Topic: Average rate of Change of a function **Duration:** 1 Day(s)

Learning Targets
The students will use functions to model and solve real-life problems.

Topic: Transforming and combining functions **Duration:** 2 Day(s)

Learning Targets
The student will find domain and range or functions. The students will work with piece-wise functions. The students will add/subtract multiply and divide functions. The students will compose functions.

Topic: Inverse Functions **Duration:** 1 Day(s)

Learning Targets
The student will find the inverse of a function numerically, graphically and algebraically.

Unit: Exponential and Logarithmic Functions **Duration:** 5 Week(s)

Unit Overview
Study the class of function and their inverse and the real world applications.

Academic Vocabulary
exponential function
simple interest
compound interest
base
exponent
principal
APR
e
logarithm
natual log
common log

Topic: Exponential Functions **Duration:** 2 Day(s)

Learning Targets
Exponential Functions, Graphs and Compound Interest

Topic: The Natural Exponential **Duration:** 2 Day(s)

Learning Targets
The students will understand exponential functions base "e"

Topic: Logarithmic Functions **Duration:** 2 Day(s)

Learning Targets
The students will evaluate, graph and use logarithmic functions.

Topic: Laws of Logarithms **Duration:** 2 Day(s)

Learning Targets
Students will rewrite functions with different bases, rewrite logarithmic expression and expand or condense logarthimic expressions.

Topic: Exponential and Logarithmic Equations **Duration:** 3 Day(s)

Learning Targets
Students will solve expoential and logarthimic equations and use expoential and logarthimic equations to model and solve problems.

Topic: Modeling and Exponential and Logarithmic Functions **Duration:** 3 Day(s)

Learning Targets
Students will use exponential and logarithmic functions to model and solve real-life problems.

Unit: Trigonometry Functions: Right Triangle Approach **Duration:** 4 Week(s)

Unit Overview
Studying trigonometry starting from the perspective of a right triangle.

Academic Vocabulary
Angle
Radian
Coterminal Angles
Trigonometric Ratios
Sine
Cosine
Tangent
Cotangent
Secant
Cosecant
Angle of Elevation
Angle of Depression
Reference Angle
Inverse SIne
Inverse Cosine
Inverse Tangent
Law of Sines
Law of Cosines

Topic: Angle Measure **Duration:** 1 Day(s)

Learning Targets
Angle measures
degrees, radians

Topic: Trigonometry of Right Triangle **Duration:** 2 Day(s)

Learning Targets
Trigonometric Ratios, Special Triangles, Applications

Topic: Trigonometric Functions of Angles **Duration:** 2 Day(s)

Topic Overview
Trignometric Functions at Any angle

Learning Targets
Trigonometric functions of angles, evaluating trigonometric functions, Identities

Topic: Inverse of Trigonometric Functions and Triangles **Duration:** 3 Day(s)

Learning Targets
Inverse sin, cos, tan. Solving right triangles, Inverse trig functions
inverse functions

Topic: The Laws of Sines **Duration:** 2 Day(s)

Learning Targets
Law of Sines

Topic: The Law of Cosines **Duration:** 1 Day(s)

Learning Targets
Law of Cosines

Unit: Trigonometric Functions: Unit Circle Approach **Duration:** 5 Week(s)

Unit Overview
Studying the trigonometric ratios as a function of real numbers and perodic motion.

Academic Vocabulary
Unit Circle
Terminal Point
Reference Number
Fundamental Identities
Circular Function
Periodic Functions
Period
Amplitude

Topic: The Unit Circle **Duration:** 1 Day(s)

Learning Targets
The student will set up and use the unit circle to evaluate trig functions.

Topic: Trigonometric Functions of Real Numbers **Duration:** 1 Day(s)

Learning Targets
The students will find values of any trig function

Topic: Trigonometric Graphs **Duration:** 2 Day(s)

Learning Targets
Students will graph of sine or cosine for two periods. The will plot curves with the use of technology. Students will understand concepts of period, vertical translation, amplitude, hortizontal translation.

Students will plot curves with the help of technology for two periods. Students will use period, amplitude and vertical and horizontal translations.

Topic: More Trigonometric Graphs **Duration:** 2 Day(s)

Learning Targets
Graphs of tangent, cotangent, secant and cosecant.

Topic: Inverse Trigonometry and Graphs **Duration:** 1 Day(s)

Learning Targets
The students will use inverse trig functions to find angle measurements.

Topic: Modeling Harmonic Motions **Duration:** 2 Day(s)

Learning Targets

The student will model harmonic motion in real world situations

Unit: Analytic Trigonometry

Duration: 4 Week(s)

Unit Overview

The study of the algebraic properties of trigonometry.

Academic Vocabulary

Identities
Addition and Subtration Formulas
Double Angle Formulas
Half Angle Formulas

Topic: Trigonometric Identities

Duration: 2 Day(s)

Learning Targets

Fundamental Identities: Negative angle, Quotient, Reciprocal and Pythagorean.

Topic: Additions and Subtraction Formulas

Duration: 2 Day(s)

Learning Targets

The student will use sum/difference formulas

Topic: Double-Angle, Half-Angle and Product-Sum Formula

Duration: 2 Day(s)

Learning Targets

The students will use the appropriate double angle, half angle or product sum formula

Topic: Basic Trigonometric Equations

Duration: 2 Day(s)

Learning Targets

The students will use inverse trig to solve linear and quadratic equations

Topic: More Trigonometric Equations

Duration: 2 Day(s)

Learning Targets

Advanced equations with quadratics and formulas

Unit: Polar Coordinates and Parametric Equations

Duration: 4 Week(s)

Unit Overview

The introduction of an alternate graphical system

Academic Vocabulary

polar axis
Complex plane
modulus
argument
DeMoivre's Theorem
Parametric function

Topic: Polar Coordinates

Duration: 1 Day(s)

Learning Targets

The student will graph r=sin theta polar equations.

Topic: Graphs of Polar Equations

Duration: 2 Day(s)

Topic: Polar Forms of Complex Numbers: **Duration:** 2 Day(s)

Learning Targets
The student will use DeMoivre's Theorem

Unit: Sequences and Series **Duration:** 5 Week(s)

Unit Overview
Mathematical analysis of sequences and patterns.

Academic Vocabulary
Sequence
Partial Sum
Sigma Notation
Arithmetic Sequence
Geometric Sequence
Binomial Theorem
Pascal's Triangle

Topic: Sequences and Summation Notation **Duration:** 2 Day(s)

Learning Targets
the students will find sums of infinite series. The students will use factorial notation. The students will use summation notation.

Topic: Arithmeteic Sequences **Duration:** 1 Day(s)

Learning Targets
The students will find partials sums of arithmetic sequences and find the nth term of arthirmetic sequence.

Topic: Geometric Sequences **Duration:** 1 Day(s)

Learning Targets
The students will find nth partial sums of a geometric sequence. The students will find sums of infinite geometric sequence.

Topic: Mathematics of Finance **Duration:** 2 Day(s)

Learning Targets
Compound interest, annuities. Real-world applications

Topic: The Binomial Theorem **Duration:** 2 Day(s)

Learning Targets
The students will binomial coefficients to write binomial expansion. The students will use Pascal's Triangle to calculate binomial coefficients.

Unit: Vectors in Two and Three Dimensions **Duration:** 4 Week(s)

Topic: Vectors in Two Dimensions **Duration:** 1 Day(s)

Learning Targets
Students will determine whether vectors are parallel or orthogonal. Students will find the component form, unit vector and magntitude of vectors.

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Topic: The Dot Product **Duration:** 1 Day(s)

Learning Targets

Students will find the dot product and angles between two vectors. The student will find cross product.

Topic: Vectors in Three Dimensions **Duration:** 2 Day(s)

Learning Targets

The student will extend their knowledge of vectors into 3 dimensions

Topic: The Cross Product **Duration:** 2 Day(s)

Learning Targets

The student will calculate and use the cross product.