

* **Seeking "Honors" Distinction:** No

* **Subject Area:** Mathematics

* **Category:**

* **Grade Level for which this course has been designed:**
 9 10 11 12

* **Unit Value:** 1.0 (one year, 2 semesters, or 3 trimesters equiv.)

* **Is this course classified as a Career Technical Education:** No

* **Brief Course Description**

Trigonometry/Math Analysis is an upper level math course designed to teach students how to think conceptually and follow a logical process for problem solving. Students will investigate the reasoning behind mathematical concepts, they will take risks and learn from their mistakes. This math course builds on the foundations learned in Algebra 1, Geometry, and Algebra 2 in order to prepare students for success in a calculus course. Students who master trigonometry/math analysis will become competent in the following topics: polynomial, rational, exponential, logarithmic, and trigonometric functions and their graphs, analytic trigonometry and additional topics in trigonometry, linear systems and matrices, sequences, series, and probability, topics in analytic geometry including analytic geometry in three dimensions, and limits with an introduction to calculus.

Pre-Requisites

A grade of C or better in Algebra 2. - Required

Co-Requisites

Context for Course
(optional)**History of Course Development**
(optional)**Textbooks****TEXTBOOK 1**

* **Title:** Precalculus With Limits: A Graphing Approach

* **Edition:** Fifth

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Publication Date: 2008

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Publisher: Houghton Mifflin Company

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Author(s): Larson, Hostetler, and Edwards

URL Resource:

* **Usage:** Primary Text

Read in entirety or near entirety

Supplemental Instructional Materials

Solutions Manual- A complete solution for each problem in the Student Edition lessons.

*** Course Purpose**

The purpose of this course is to build on the foundations learned in Algebra 1, Geometry, and Algebra 2 in order to prepare students for success in a calculus course. Students who master trigonometry/math analysis will become competent in the following topics: polynomial, rational, exponential, logarithmic, and trigonometric functions and their graphs, analytic trigonometry and additional topics in trigonometry, linear systems and matrices, sequences, series, and probability, topics in analytic geometry including analytic geometry in three dimensions, and limits with an introduction to calculus. Not only will students learn these specific concept topics, but they will also learn how to reason mathematically. Students will gain familiarity with formulas and will gain confidence in their abilities so that they can apply this knowledge in unfamiliar scenarios. Students will learn to justify each assertion they make, and have the tenacity needed to follow a problem through to the end.

*** Course Outline**

Coursework will include a thorough understanding and application of the following topics as they are presented in the text.

Functions and Their Graphs:

Find the slopes of lines and write equations of lines.

Identify, categorize, and describe functions.

Graph functions and find their domain and range.

Represent simple transformations of functions.

Perform arithmetic operations to combine functions and compose one function on another.

Explore inverse functions and their graphs.

Use scatter plots to interpret and model data.

Polynomial and Rational Functions:

Write, graph, and analyze quadratic functions.

Use transformations, the Leading Coefficient Test, zeros of polynomials, and the Intermediate Value Theorem to sketch polynomial functions.

Use long division and synthetic division of polynomials.

Perform simple arithmetic operations with complex numbers.

Understand and apply the Fundamental Theorem of Algebra.

Find the domains and asymptotes of rational functions.

Analyze and sketch graphs of rational functions and their asymptotes.

Exponential and Logarithmic Functions:

Recognize, evaluate, and graph exponential and logarithmic functions.

Use properties of logarithms to evaluate, rewrite, expand, or condense logarithmic expressions.

Recognize and use models involving exponential and logarithmic functions to solve real-life problems.

Trigonometric Functions:

Use and convert between degree and radian measure.

Identify a unit circle and use it to evaluate trigonometric functions such as sine and cosine.

Evaluate trigonometric functions of acute and obtuse angles.

Use amplitude and period to sketch the graphs of sine, cosine, tangent, secant, cosecant, and cotangent functions and their translations.

Evaluate and graph inverse trigonometric functions and compositions of trigonometric functions.

Analytic Trigonometry:

Use trigonometric identities to evaluate, simplify, and rewrite trigonometric expressions and functions.

Verify trigonometric identities.

Solve trigonometric equations of the quadratic type, using multiple angles and inverse trigonometric functions.

Use sum and difference formulas to evaluate trigonometric functions, verify trigonometric identities, and solve trigonometric equations.

Know and use multiple-angle, power-reducing, half-angle, and product-to-sum or sum-to-product formulas to rewrite and evaluate trigonometric functions.

Additional Topics in Trigonometry:

Use the Law of Sines and the Law of Cosines to solve triangles.

Perform basic vector operations and represent vectors graphically.

Find the dot product of two vectors, find angles between vectors, and write vectors as sums of two vector components.

Write trigonometric forms of complex numbers, find their absolute values, powers, and n th roots, and multiply and divide complex numbers.

Linear Systems and Matrices:

Solve systems of equations in two variables using substitution, graphing, and elimination.

Solve multivariable linear systems using back-substitution, matrices, Cramer's Rule, or Gaussian elimination.

Write matrices, add, subtract, and multiply matrices.

Find and use inverses of matrices.

Find the determinants, minors, and cofactors of square matrices.

Use determinants to find areas of triangles or to decide whether points are collinear, and use matrices to encode or decode messages.

Sequences, Series, and Probability:

Use sequence, factorial, and summation notation.

Recognize, write, and find the n th terms and partial sums of arithmetic and geometric sequences.

Find sums of infinite geometric series.

Complete proofs by induction involving a positive integer n .

Find the sums of powers of integers and finite differences of sequences.

Use the Binomial Theorem to calculate binomial coefficients and then write binomial expansions.

Solve counting problems using the Fundamental Counting Principle, permutations, and combinations.

Find probabilities of events, whether mutually exclusive or independent.

Topics in Analytic Geometry:

Write equations of circles, parabolas, ellipses, and hyperbolas, and examine their graphs.

Solve systems of quadratic equations.

Evaluate, graph, and rewrite parametric equations based on the given parameter.

Plot points and find representations of points in the polar coordinate system.

Convert points and equations from rectangular to polar form and vice versa.

Graph polar equations by point plotting, using symmetry, zeros, and maximum r-values.

Define the eccentricities of conics, graph conics, and write equations of conics.

Analytic Geometry in Three Dimensions:

Plot points, find distances between points, and midpoints of line segments in the three-dimensional coordinate system.

Write equations of spheres.

Find the component forms, the unit vectors, dot products, and angles of vectors in space.

Find cross-products of vectors and use their geometric properties in space.

Find parametric and symmetric equations of lines and planes in space.

Sketch planes and find the distances between points and planes in space.

Limits and an Introduction to Calculus:

Use a variety of techniques to estimate limits, evaluate limits, and determine whether limits of functions exist.

Evaluate one-sided limits and limits of difference quotients.

Use tangent lines, the limit definition, and derivatives to find slopes of graphs at a

point.

Find limits of sequences and evaluate limits of functions at infinity.

Find limits of summations and use them to find areas of plane regions.

*** Key Assignments**

Homework:

Daily homework assignments will be given that help the students independently practice the material taught in each section of the textbook and review concepts from previous sections. The problem sets will be taken primarily from the textbook, and the teacher will decide which problems to assign. Students will complete the assignments and check their work in the solutions manual. For students who participate in classes held at the school site, the homework will be turned in to the teacher on a daily basis. For students who are taking the class independently, the homework will be turned in to the personalized learning teacher on a weekly or monthly basis.

Tests and Quizzes:

At a minimum, tests will be given at the end of each chapter to determine how fully the students understand and remember the concepts they have learned. Quizzes may be given as a formative assessment throughout the chapter at the discretion of the teacher. Tests and quizzes may have questions that are multiple choice, short answer, matching, true/false, or open-ended. There will be a cumulative final given at the end of each semester to assess overall student retention and comprehension.

Applied concept projects as determined by teacher:

- Oral Presentation: Students present information during weekly class meetings both formally and informally. Presentations include Power Point, debate, and discussion, and always include an outline or handout and audio-visual aides.
- Library/Internet Research: Students research topics that are relevant to

the reading assignments and give written and oral reports of their findings.

* Instructional Methods and/or Strategies

College Model of Education: Personalized Learning Model emphasizes independent study while attending resource center classes three times weekly. Students may choose to meet weekly with their Personalized Learning Teacher and/or Highly Qualified Teacher instead. The same instructional methods are used in either case.

- Direct Instruction

- Project/Group Work

- On-line/interactice instruction

- Presentation: Concepts are introduced, explained, and demonstrated during weekly class/teacher (Personalized Learning and Highly Qualified) meetings. Following the information, corresponding questions, writing assignments, and activities are given to evaluate comprehension.
- Discussion: Students analyze, discuss, and respond to issues and ideas stimulated by presentations and readings. Students work in small groups or one-on-one whenever possible to increase participation.

* Assessment Methods and/or Tools

- Attendance at Resource Center class three times weekly or weekly review of work by Personalized Learning Teacher/Highly Qualified Teacher.
- Oral Presentations
- Discussions: classroom participation and small group work. If not enrolled in Resource Center class then weekly discussions with Personalized Learning Teacher/Highly Qualified Teacher
- Weekly homework assignments
- Chapter/Unit tests
- Comprehensive midterm/final

Assessment tools may also include the following:

- Student demonstrations
- Student work samples
- Research projects
- Projects: Power Point presentation, brochures, community service, etc.

Exams, homework assignments, discussions, oral presentations, and writing

assignments are used to assess student progress. All work is corrected by the course instructor and/or Personalized Learning Teacher/Highly Qualified Teacher.

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