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Date reviewed: September 14, 2015  
C&GE Approved: October 12, 2015  
Board Approved: November 11, 2015  
Semester Approved: Fall 2016  
Text Updated: Fall 2017

Mathematics (MATH) 1530 Plane Trigonometry (4 units) CSU  
[formerly Mathematics 31]

Prerequisite: Successful completion of Mathematics 1060 or the equivalent

Prerequisite knowledge/skills: Before entering the course the student should be able to

1. identify numbers as belonging to specified sets, and graph discrete and continuous sets of real numbers,
2. perform the basic arithmetic operations with positive and negative real numbers, plus raising to powers,
3. know and apply the rules of exponents and the order of operations in algebraic calculations,
4. know and apply the properties of addition and multiplication for real numbers and identify their use in practice,
5. solve linear equations and inequalities in one variable, and analyze and solve applications leading to such equations or inequalities,
6. solve and graph the solutions of compound inequalities or absolute value inequalities in one variable,
7. perform addition, subtraction, multiplication and division of polynomials,
8. factor simple polynomials, with special emphasis on trinomials quadratic in form, and solve related polynomial equations,
9. add, subtract, multiply and divide rational algebraic expressions, and reduce to lowest terms,
10. solve equations involving rational algebraic expressions, and analyze and solve word problems leading to such equations,
11. simplify radical expressions involving numbers and/or variables,
12. use fractional exponents,
13. perform addition, subtraction, multiplication and division of expression involving radicals and complex numbers and simplify the results, including rationalization of denominators,
14. solve equations that involve radicals,
15. solve quadratic equations in one variable, and equations quadratic in form, by factoring, completing the square, and the quadratic formula,
16. analyze and solve application problems requiring the use of quadratic equations,
17. solve and graph quadratic inequalities in one variable,
18. graph points in the rectangular coordinate system, and straight lines from ordered pairs obtained from its equation,
19. determine the slope of the line between any specified pair of points,
20. know the slope forms of the equation of a straight line, and be able to determine the equation of a particular straight line from specified input information,
21. solve and graph linear inequalities in two variables,
22. solve linear systems of equations in two or three variables algebraically, and solve those in two

- dimensions graphically,
- 23. analyze and solve application problems requiring the use of linear systems of equations in two or three variables,
- 24. evaluate determinants and use them to solve linear systems of equations,
- 25. determine whether or not a specified relation is a function,
- 26. for a function, compute the value of the function given the value of the independent variable, and be able to construct the inverse of simple functions in numeric or algebraic terms,
- 27. identify the quadratic equation representing a specific conic section, and be able to draw the graph of a conic section by analyzing its equation, or to write the equation of a specified conic section,
- 28. solve nonlinear systems of equation involving the intersection of two conic sections or a conic section and a straight line,
- 29. compute and graph specified exponential and logarithmic functions,
- 30. know the properties of logarithms (product, quotient, power and change of base rules) and be able to use them in practical numerical computations using a table of common logarithms or a calculator, and
- 31. solve simple exponential and logarithmic equations.

Total Hours: 64 hours lecture

Catalog Description: This course includes the study of trigonometric functions, their inverses and their graphs, identities and proofs related to trigonometric expressions, trigonometric equations, solving right triangles, solving triangles using the Law of Cosines and the Law of Sines, polar coordinates, and introduction to vectors. C-ID: MATH 851

Type of Class/Course: Degree Credit

Text: Lial, Margaret, et al. *Trigonometry*. 11<sup>th</sup> ed. Pearson, 2017.

Additional Instructional Materials: Basic scientific calculator with trig, log, and exponential functions

Course Objectives:

By the end of the course, a successful student will be able to:

1. Identify special triangles and their related angle and side measures;
2. Evaluate the trigonometric function of an angle in degree and radian measure;
3. Manipulate and simplify a trigonometric expression;
4. Solve trigonometric equations, triangles, and applications;
5. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs;
6. Evaluate and graph inverse trigonometric functions;
7. Prove trigonometric identities;
8. Convert between polar and rectangular coordinates and equations;
9. Graph polar equations;
10. Calculate powers and roots of complex numbers using DeMoivre's Theorem; and
11. Represent a vector (a quantity with magnitude and direction) in the form  $\langle a,b \rangle$  and  $a_i + b_j$ .

Course Scope and Content:

- Unit I      Introduction to Trigonometry
  - A.      Angle Measure and Special Triangles
  - B.      Properties of Triangles; Similar Triangles
  - C.      Trigonometry: A View from the Coordinate Plane
  - D.      Fundamental Identities and Families of Identities
  
- Unit II     Right Triangles & Static Trigonometry
  - A.      A Right Triangle View of Trigonometry
  - B.      Solving Right Triangles
  - C.      Applications of Static Trigonometry
  - D.      Extending Beyond Acute Angles
  
- Unit III    Radian Measure & Dynamic Trigonometry
  - A.      Angle Measure in Radians
  - B.      Arc Lengths, Velocities, and the Area of a Circular Sector
  - C.      The Unit Circle
  
- Unit IV    Trigonometric Graphs and Models
  - A.      Graphs of Sine and Cosine Functions
  - B.      Graphs of Cosecant, Secant, Tangent and Cotangent Functions
  - C.      Transformations of Trigonometric Graphs
  - D.      Trigonometric Applications and Models
  
- Unit V     Trigonometric Identities
  - A.      More on Verifying Identities
  - B.      The Sum and Difference Identities
  - C.      The Double Angle and Half Angle Identities
  - D.      The Product-to-Sum and Sum-to-Product Identities
  
- Unit VI    Inverse Functions and Trigonometric Equations
  - A.      One-to-One and Inverse Functions
  - B.      Inverse Trigonometric Functions and their Applications
  - C.      Solving Basic Trigonometric Equations
  - D.      General Trigonometric Equations and Applications
  
- Unit VII   Applications of Trigonometry

- A. Oblique Triangles and the Law of Sines
- B. The Law of Cosines; the Area of a Triangle
- C. Vectors and Vector Diagrams
- D. Vectors Applications and the Dot Product

Unit VIII Trigonometric Connections to Algebra

- A. Complex Numbers
- B. Complex Numbers in Trigonometric Form
- C. Demoivre’s Theorem and the nth Roots Theorem

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 8 hours per week outside regular class time doing the following:

- 1. Studying
- 2. Skill practice
- 3. Completing required reading
- 4. Problem solving activity or exercise

Methods of Instruction:

- 1. Lecture-demonstrations and sample problems by instructor
- 2. Class discussions
- 3. Audiovisual presentations

Methods of Evaluations:

- 1. Computational or non-computational problem-solving demonstrations, including:
  - a. exams
  - b. homework problems
  - c. quizzes
  - d. projects

Supplemental Data:

TOP Code:	170100: Mathematics, General
SAM Priority Code:	E: Non-Occupational
Funding Agency:	Y: Not Applicable(funds not used)

Program Status:	I: Program Applicable
Noncredit Category:	Y: Not Applicable, Credit Course
Special Class Status:	N: Course is not a special class
Basic Skills Status:	N: Course is not a basic skills course
Prior to College Level:	Y: Not applicable
Cooperative Work Experience:	N: Is not part of a cooperative work experience education program
Eligible for Credit by Exam:	E: Credit By Exam
Eligible for Pass/No Pass:	C: Pass/No Pass
Taft College General Education:	CSB4: CSU Area B4 LCAT: Local GE Communication