

MATH-154H: HONORS TRIGONOMETRY

Cuyahoga Community College

Viewing: MATH-154H : Honors Trigonometry

Board of Trustees:

October 2022

Academic Term:

Fall 2023

Subject Code

MATH - Mathematics

Course Number:

154H

Title:

Honors Trigonometry

Catalog Description:

Topics include trigonometric functions and their values for all angles, vectors and oblique triangles, graphs of trigonometric functions, trigonometric identities and equations. Applications and activities to build skills in problem solving included. Emphasis on more challenging trigonometric concepts in real-world settings are found in the form of projects and in-class presentations.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

MATH-1530 College Algebra or MATH-153H Honors College Algebra; or departmental approval.

Note: MATH-1275 MATH-1280, MATH-1521, or MATH-152H taken prior to Fall 2016 will be accepted to meet prerequisite requirements for this course.

Outcomes

Course Outcome(s):

Define and evaluate trigonometric functions.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

1. Define and use the vocabulary of angles.
2. Evaluate the six trigonometric functions using the unit circle, a right triangle, or any angle.
3. Graph the six trigonometric functions and their transformations.
4. Evaluate the inverse trigonometric functions.
5. Model and solve applications of trigonometric functions.

Course Outcome(s):

Analyze, define, and interpret analytic trigonometry.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

- a. Verify identities using fundamental trigonometric identities.
- b. Verify identities using the sum/difference, double angle, power-reducing angle, and half-angle formulas.
- c. Define and apply the sum/difference, double angle, power-reducing, and half-angle formulas to find exact values of trigonometric expressions.
4. Solve trigonometric equations.

Course Outcome(s):

Analyze, interpret, define and apply the Laws of Trigonometry and their Applications.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

Objective(s):

- a. Use the Law of Sines and Law of Cosines to solve oblique triangles.
- b. Define, graph, and perform operations with complex numbers.
- c. Define, graph, analyze polar coordinates and polar equations.
- d. Define, model and perform operations with vectors and their applications.

Methods of Evaluation:

- a. Exams
- b. Quizzes
- c. Homework
- d. Projects
- e. Collaborative work
- f. Comprehensive final exam
- g. **Honors Assignments:** Honors assignments consist of, but not limited to, collaborative class work, take-home projects, and/or research assignments.

Course Content Outline:

1. Vocabulary of angles
 - a. Standard position
 - b. Quadrantal, coterminal, and reference angles
 - c. Degree and radian measure
 - d. Arc length
 - e. Linear and angular speed
2. Six trigonometric functions.
 - a. Unit circle
 - b. Right triangle ratios
 - c. Any angle function
 - d. Exact value of 30° ($\#/6$), 45° ($\#/4$), 60° ($\#/3$) angles
 - e. Using calculator
3. Graphs of trigonometric functions.
 - a. Domain and range
 - b. Period and amplitude

- c. Phase and vertical shift
- d. Asymptotes
- 4. Inverse trigonometric functions.
 - a. Restricted domains
 - b. Exact value
 - c. Composite functions
 - d. Using a calculator
- 5. Modeling and applications of trigonometric functions
 - a. Using right triangles
 - b. Bearing from point to point
 - c. Simple harmonic motion
- 6. Basic Trigonometric Identities
 - a. Reciprocal
 - b. Quotient
 - c. Pythagorean
 - d. Even-odd
- 7. Principal Identities
 - a. Sum and difference
 - b. Double-angle and half-angle
 - c. Power-reducing
 - d. Cofunction
 - e. Sum-to-product and product-to-sum
- 8. Solving
 - a. Single trigonometric functions
 - b. Equations involving multiple angles
 - c. Using calculator
- 9. The Law of Sines and Law of Cosines
 - a. Oblique (AAS, ASA, SSA) triangles and Law of Sines
 - b. Oblique (SAS, SSS) triangles and Law of Cosines
 - c. Area of oblique triangles
- 10. Complex
 - a. Graphical representation
 - b. Trigonometric notation
 - c. Multiplication and division
 - d. Powers and roots of complex numbers
- 11. Polar
 - a. Rectangular coordinates as polar
 - b. Complex coordinates as polar
 - c. Polar and rectangular equations
 - d. Graphs of polar equations
- 12. Vectors
 - a. Direction and magnitude
 - b. Scalar
 - c. Position and unit vector
 - d. Operations on vectors
 - e. Dot product and angle between vectors
 - f. Modeling and applications

Resources

Beecher, Penna, Bittinger. *Precalculus: A Right Triangle Approach*. 5th. Pearson, 2016.

Blitzer, Robert. *Precalculus*. 6th. Pearson, 2018.

Desmos. Desmos, Inc., 2021. www.desmos.com

Khan Academy. Khan Academy, 2021. www.khanacademy.org

Precalculus Plus Integrated Review. 3rd edition. Hawkes Learning, 2021. <https://www.hawkeslearning.com/Products/Math/PRC3/Precalculus3ePlusIntegratedReview.html>

Instructional Services

OAN Number:

Ohio Transfer 36 TMM003 and TMM002 (2 of 2 courses, both must be taken)

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