EASTERN ARIZONA COLLEGE
Precalculus Trigonometry
Course Design
2019-2020

Course Information

Division	Mathematics
Course Number	MAT 181
Title	Precalculus Trigonometry
Credits	3
Developed by	Gary Roth
Lecture/Lab Ratio	3 Lecture/0 Lab

Transfer Status

ASU	NAU	UA
MAT Dept Elective, Mathematics (MA)	MAT Departmental Elective; Science & Applied Science [SAS]	MATH 111

Activity Course	No
CIP Code	27.0101
Assessment Mode	Final Exam (15 Questions/100 Points)
Semester Taught	Fall and Spring
GE Category	Mathematics
Separate Lab	No
Awareness Course	No
Intensive Writing Course	No
Diversity and Inclusion Course	No

Prerequisites

MAT 154 with a grade of "C" or higher or concurrent enrollment in MAT 154 or placement test score as established by District policy and ENG 091 with a grade of “C” or higher or reading placement test score as established by District policy

Educational Value

Appropriate for students whose major is Mathematics, Physics, Chemistry, or Engineering.

Description

Trigonometric functions, identities and equations; development and application of the various formulae for solving triangles, vectors, and complex numbers.

Supplies

Scientific Calculator

Competencies and Performance Standards

1. Apply techniques of angle measures to develop and use trigonometric functions and Pythagorean identities.

Learning objectives

What you will learn as you master the competency:

a. Find the degree measure of angles and calculate coterminal angles.

b. Apply properties of similar triangles to the solving of application problems.

c. Define the trigonometric functions for quadrantal angles and non-quadrantal angles.

d. Use the definitions of trigonometric function to develop and use reciprocal, quotient, and Pythagorean identities.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner finds the measure of an angle in degrees
- learner finds the measure of co-terminal angles in degrees
- learner solves applied problems using similar triangles
- learner states the values of the six trigonometric functions for a given angle
- learner states the reciprocal, quotient, and Pythagorean identities and uses them to find trigonometric function values

2. Apply techniques involving right triangle ratios to solve for unknown quantities such as angle measures and side lengths.

Learning objectives

What you will learn as you master the competency:

a. Solve angle of elevation and angle of depression problems.

b. Relate trigonometric functions to angle and real number domains.

c. Apply special reference triangle and angle property rules of 30-60 degree and 45 degree right triangles to solve application problems.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner defines the basic trigonometric functions on the set of real numbers
- learner uses a reference triangle to find the unknown information of a given trigonometric application problem
- learner solves angle of elevation and angle of depression problems
- learner solves for unknown quantities of similar or right triangles by applying the appropriate algebraic and trigonometric solving techniques

3. Apply techniques of trigonometric functions to solve problems for linear and angular velocity in both degree and radian measure.

Learning objectives

What you will learn as you master the competency:

a. Apply algebraic techniques to calculate lengths of arcs and to convert between radian and degree measure of angles.

b. Define circular functions with their associated domain, range, and periodic properties.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner finds the measure of an intercepted arc given either a central or an inscribed angle measure
- learner finds the measure of an angle given the measure of an intercepted arc and that the angle is either a central or an inscribed angle
- learner sketches the basic trigonometric functions on a unit circle
- learner states the domain, the range, and the period for any trigonometric or circular function
- learner computes the value of a circular function

4. Apply basic graphing techniques to sketch graphs of trigonometric functions.

Learning objectives

What you will learn as you master the competency:

a. Graph all the basic trigonometric functions and state the appropriate domain, range, amplitude and period for each graph of: Sine, Cosine, Tangent, Cosecant, Secant and Cotangent.

b. Graph trigonometric functions containing altered phase shift and amplitude values.

Performance Standards

You will demonstrate your competence:

- on assigned activities
- on written exams
- on a comprehensive final exam

Your performance will be successful when:

- learner sketches all basic trigonometric functions and state the appropriate information for domain, range, amplitude, and period
- learner sketches a trigonometric function in the form of $y = k + A\sin(Bx + C)$ or $y = k + A\cos(Bx + C)$
- learner sketches the co-function of any basic trigonometric function and state the appropriate information for domain, range, amplitude and phase shift

5. Apply basic fundamental trigonometric identities to verify and prove the other trigonometric identities; sum, difference, co-function, double-angle, half-angle, product-sum and sum-product.

Learning objectives

What you will learn as you master the competency:

a. Apply basic trigonometric identities and properties of algebra to prove whether a given statement is valid.

b. Apply basic trigonometric identities and algebraic properties to prove the validity of complex and compound trigonometric identities.

c. Exhibit an understanding of the nature, construction and reasoning of an elementary trigonometric proof.

Performance Standards

You will demonstrate your competence:

o on assigned activities

o on written exams

o on a comprehensive final exam

Your performance will be successful when:

o learner constructs a two column proof containing steps and associated reasons

o learner writes a proof which verifies the validity of a stated identity

o learner constructs proofs of nontrivial trigonometric identities

6. Apply solving techniques for inverse trigonometric functions, equations, and inequalities.

Learning objectives

What you will learn as you master the competency:

a. Explain how inverse trigonometric functions facilitate the solving of trigonometric functions.

b. Apply inverse trigonometric and algebraic solving techniques on trigonometric functions to find specified information.

c. Construct a graph showing the basic trigonometric function and the appropriate inverse function with accompanying domain, range, and amplitude and period information.

d. Construct a graph showing a trigonometric function and the inverse trigonometric function where amplitude, period, and phase shift have been altered from the basic form.

Performance Standards

You will demonstrate your competence:

o on assigned activities

o on written exams

o on a comprehensive final exam

Your performance will be successful when:

o learner constructs a graph for each basic inverse trigonometric function and state the appropriate domain, range, amplitude, period and phase shift

o learner constructs an inverse trigonometric function graph for a given nontrivial trigonometric function graph

o learner solves trigonometric equations by applying inverse solving techniques

7. Apply solving techniques using the law of Sines, Cosines and vectors to find missing information in application problems.

Learning objectives

What you will learn as you master the competency:

a. Apply the laws of Sines and Cosines to find missing angles and sides for any given triangle.

b. Apply formulas for finding areas of triangles with various types of given information.

c. Define vectors as directed line segments in the plane and as two component geometric objects.

d. Apply algebraic techniques to combine two component objects.

e. Exhibit an understanding of the interplay between vectors as geometric objects and vectors as directed line segments.

f. Apply solving techniques of directed geometric vectors to find solutions for angle measurement, direction and distance measurement in application problems.

Performance Standards

You will demonstrate your competence:

o on assigned activities

o on written exams

o on a comprehensive final exam

Your performance will be successful when:

o learner finds missing angles and sides of a triangle by using the laws of Sines and Cosines

o learner finds the areas of given triangles by using given base and height information, length of two sides and included angle; or Heron's formula for three given sides

o learner correctly combines two component parts using addition, subtraction, multiplication, division, scalar, and dot product procedures

o learner correctly computes from two given vectors the length of the resultant vector and the measure of the included angle

o learner correctly constructs and solves a directed geometric model of an application problem

8. Create powers and n^{th} roots of complex numbers using De Moivre's Theorem.

Learning objectives

What you will learn as you master the competency:

a. Raise any complex number to any positive integer power.

b. Find and graph all n^{th} roots of any complex number.

c. Find all complex solutions of a higher-order equation.

Performance Standards

You will demonstrate your competence:

o on assigned activities

o on written exams

o on a comprehensive final exam

Your performance will be successful when:

o learner writes the trig form of a complex number

o learner uses the product/quotient theorems to find the product/quotient of two complex numbers

- learner uses De Moivre's Theorem to raise a complex number to a positive integer power
- learner uses the n^{th} root Theorem to find and graph all specified roots of a complex number
- learner calculates all complex number solutions of a higher-order equation

Types of Instruction

Classroom Presentation

Grading Information

Grading Rationale

Each instructor has the flexibility to develop evaluative procedures within the following parameters.

1. Written exams must represent at least 60% of the final course grade
2. Final exam must represent at least 20% of the final course grade.
3. Other activities may represent at most 20% of the final course grade.

Grading Scale

A 90%-100%
B 80%-89%
C 70%-79%
D 60%-69%
F Below 60%