South Central College

MATH 125 Trigonometry

Course Outcome Summary

Course Information

Description	A study of the six trigonometric functions, their inverses and their applications forms the heart of this course. First, the two common methods of angle measure are derived along with the related notions of length of arc and area of a sector. Then the trigonometric functions are defined in terms of the unit circle and their properties such as domain, range, period and amplitude are explored, along with their associated graphs. This leads to a study of identities and conditional equations. Triangle trigonometry and real-world applications follow, with an investigation of associated themes such as vectors, exponential and logarithmic functions.(Prerequisites: MATH 120 with a grade of C or better or a score of 63 or above on the College Level Mathematics portion of the Accuplacer test.) (MNTC 4: Mathematical/Logical Reasoning)
Total Credits	3
Total Hours	48

Types of Instruction

Instruction Type	Credits/Hours
Lecture	3 semester hours

Pre/Corequisites

MATH 120 with a grade of C or better or a score of 63 or above on the College Level Mathematics portion of the Accuplacer test.

Institutional Core Competencies

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1.   Review essential concepts from algebra

Learning Objectives
Define a function as a set of ordered pairs
Define one-to-one functions
Determine if a function is one-to-one or not
Show that one-to-one functions have inverses
Find the inverses of common algebraic functions

2. **Review essential concepts from analytic geometry**

   Learning Objectives
   Define the Cartesian plane
   Prove and use the distance formula
   Graph linear functions
   Determine slope and intercepts of of linear functions
   Graph quadratic functions
   Determine vertex, axis of symmetry, intercepts and other features of the parabola
   Graph quadratic relations
   Determine center and radius of a circle
   Test a relation for graph symmetry with respect y-axis, x-axis or origin

3. **Review transformations applied to graphs of common functions**

   Learning Objectives
   Define the sum, difference, product and quotient of functions
   Define the composition of functions
   Translate a graph vertically or horizontally
   Stretch a graph vertically or horizontally
   Compress a graph vertically or horizontally
   Reflect a graph vertically or horizontally
   Develop a library of common functions and their graphs

4. **Define methods for measurements of angles**

   Learning Objectives
   Define degree measure
   Define median measure
   Convert between these two measures

5. **Define the trigonometric functions on domains of sets of real numbers**

   Learning Objectives
   Interpret the wrapping function which assigns an ordered pair to a real number
   Define sine, cosine, tangent, cosecant, secant and cotangent as a functions of a real variable
   Determine the signs of the functions in each of the four quadrants

6. **Prove basic properties of the trigonometric functions**

   Learning Objectives
   Determine the domains and ranges of the six trigonometric functions
   Establish the cofunction relations
   Prove the Pythagorean identities
   Compute the exact values of trigonometric functions of multiples of pi/2, pi/3, pi/4 and pi/6.

7. **Analyze the graphs of the six trigonometric functions**

   Learning Objectives
   Graph each of the six trigonometric functions using transformations and symmetry
   Determine amplitude
   Determine phase shift
   Determine period

8. **Deduce properties of the six inverse trigonometric functions**

   Learning Objectives
   Define the six inverse trigonometric functions
   Analyze the graphs of the inverse trigonometric functions

9. **Explore analytic properties of the trigonometric functions**

   Learning Objectives
   Define identity, conditional equation and contradiction
   Practice many methods for establishing trigonometric identities

Solve trigonometric conditional equations

10.   **Deduce various conversion formulas**

Learning Objectives
Prove the sum and difference formulas
Prove the double-angle formula
Prove the half-angle formula
Prove the sum-to-product formula
Prove the product-to-sum formula

11.   **Apply the trigonometric functions to angle, length and area measurement problems**

Learning Objectives
Interpret the trigonometric functions as functions of acute angle measure
Solve right triangle problems using trigonometry
Deduce the Law of Sines
Deduce the Law of Cosines
Deduce Heron's formula for the area of a triangle

12.   **Model periodic phenomena with the trigonometric functions**

Learning Objectives
Explain simple harmonic motion
Review notions of period, phase shift and amplitude
Examine classical applications of simple harmonic motion

13.   **Graph equations specified in polar form**

Learning Objectives
Explain the polar coordinate system
Sketch graphs of equations given in polar form
Determine symmetry of polar graphs
Convert between the rectangular and polar coordinate planes

14.   **Apply trigonometry to the complex numbers**

Learning Objectives
Define the rectangular complex plane
Define the polar complex plane
Convert between the two systems
Simplify expressions using DeMovier's theorem

15.   **Develop basic vector operations**

Learning Objectives
Define vector
Define scalar multiplication
Define vector addition
Express a vector as a linear combination of the unit vectors

16.   **Apply vectors to real world situations**

Learning Objectives
Define dot product algebraically
Show the equivalence of the trigonometric interpretation of dot product
Model real world applications using vector operations

17.   **Interpret graphs of exponential functions**

Learning Objectives
"Define" exponential function
Determine domain and range of the exponential function
Determine intervals where the exponential functions increase or decrease
Determine asymptotes and intercepts of exponential functions
Graph exponential functions, utilizing transformations

Show that exponential functions are one-to-one

18.   Develop useful properties of exponential functions

Learning Objectives
Extend exponent manipulations to include any real number
Apply this function to problems involving exponential growth or decay
Preview the utility of the natural base, e

19.   Interpret graphs of logarithmic functions

Learning Objectives
Define the logarithm function as the inverse of the exponential function
Determine domain and range of the logarithmic functions
Determine intervals where the logarithmic functions increase or decrease
Determine asymptotes and intercepts of logarithmic functions
Graph logarithmic functions, utilizing transformations

20.   Develop useful properties of logarithmic functions

Learning Objectives
Prove and use Napier's three properties of logarithms
Demonstrate the inverse relationship with exponentials for certain simplification problems
Prove and use other properties of logarithms
Solve logarithmic equations

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