



**COWLEY COLLEGE
& Area Vocational Technical School**

COURSE PROCEDURE FOR

**TRIGONOMETRY
MTH 4425 3 Credit Hours**

Student Level:

This course is open to students on the college level in the freshman year.

Catalog Description of the Course

MTH4425 - TRIGONOMETRY (3 hrs)

[KRSN MAT1030]

Trigonometric functions using the unit circle and right angle trigonometry, graphing applications, analytic trigonometry, vectors, trigonometric complex number applications, parametric and polar equations. This course requires that the students furnish their TI-83 or TI-84PLUS graphing calculator.

Prerequisite:

A minimum grade of C in MTH 4420 or 23 ACT math score or satisfactory course placement assessment scores.

Controlling Purpose:

To provide pre-calculus and physics students with a knowledge of the functions and basic applications of trigonometry.

Learner Outcomes:

Students will master the properties of the six basic functions of trigonometry and their inverses through algebraic and graphic analysis, and make applications to geometric measure, mechanics, wave length, vectors, and complex numbers.

Units Outcomes and Criterion Based Evaluation Key for Core Content:

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

Evaluation Key:

- A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.

- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

Chapter 1						GRAPHS AND FUNCTIONS		Section: 1.1 – 1.7	
Outcomes:						The student will be able to plot points, use the Distance and Midpoint Formulas, sketch graphs of equations; find and use the slopes of lines to write and graph linear equations; evaluate functions and find their domains; analyze graphs of functions and their transformations; and find inverse of functions.			
A	B	C	D	F	N	Specific Competencies			
						Demonstrate the ability to:			
						*1.1	Use the distance formula.		
						*1.1	Use the midpoint formula.		
						*1.2	Graph equations by plotting points.		
						*1.2	Find intercepts from a graph.		
						*1.2	Find intercepts from an equation.		
						*1.2	Test an equation for symmetry with respect to the <i>x</i> -Axis, the <i>y</i> -Axis, and the Origin.		
						*1.2	Know how to Graph Key Equations.		
						*1.2	Write the standard form of the equation of a circle.		
						*1.2	Graph a circle.		
						*1.2	Work with the general form of the equation of a circle.		
						*1.3	Determine whether a relation represents a function.		
						*1.3	Find the value of a function.		
						*1.3	Find the domain of a function.		

* DENOTES OPTIONAL MATERIAL

REV: 6/29/2016

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Chapter 1 GRAPHS AND FUNCTIONS

Section: 1.1 – 1.7

Outcomes: The student will be able to plot points, use the Distance and Midpoint Formulas, sketch graphs of equations; find and use the slopes of lines to write and graph linear equations; evaluate functions and find their domains; analyze graphs of functions and their transformations; and find inverse of functions.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						*1.3	Identify the graph of a function.
						*1.3	Obtain information from or about the graph of a function.
						*1.4	Determine even and odd functions from a graph.
						*1.4	Identify even and odd functions from the equation.
						*1.4	Use a graph to determine where a function is increasing, decreasing, or constant.
						*1.4	Use a graph to locate local maxima and minima.
						*1.4	Use a graphing utility to approximate local maxima and minima and to determine where a function is increasing or decreasing.
						*1.4	Find the average rate of change of a function.
						*1.5	Graph the functions listed in the library of functions.
						*1.5	Graph piecewise-defined functions.
						*1.6	Graph Functions using vertical and horizontal shifts.
						*1.6	Graph functions using compressions and stretches.
						*1.6	Graph functions using reflections about the <i>x</i> -Axis and the <i>y</i> -Axis.
						*1.7	Determine whether a function is one-to-one.
						*1.7	Determine the inverse of a function defined by a map or a set of ordered pairs.
						*1.7	Obtain the graph of the inverse function from the graph of the function.
						*1.7	Find the inverse of a function defined by an equation.

Chapter 2 TRIGONOMETRIC FUNCTIONS

Section 2.1 – 2.6

Outcomes: The student will be able to describe an angle in both degrees and radians; identify a unit circle and its relationship to real numbers; evaluate trigonometric functions of any angle; use fundamental trigonometric identities; sketch graphs of trigonometric functions; evaluate inverse trigonometric functions and their composition; use trigonometric functions to model and solve real-life problems.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						2.1	Convert between decimals and degrees, minutes, seconds forms for angles.
						2.1	Find the arc length of a circle.
						2.1	Convert from degrees to radians and from radians to degrees.
						2.1	Find the area of a sector of a circle.
						2.1	Find the linear speed of an object traveling in circular motion.
						2.2	Find the exact values of the trigonometric functions using a point on the unit circle.
						2.2	Find the exact values of the trigonometric functions of quadrantal angles.
						2.2	Find the exact values of the trigonometric functions of $\pi/4 = 45$ degrees.
						2.2	Find the exact values of the trigonometric functions of $\pi/6 = 30$ degrees and $\pi/3 = 60$ degrees.
						2.2	Find the exact value of the trigonometric functions for integer multiples of $\pi/6 = 30$ degrees, $\pi/4 = 45$ degrees, and $\pi/3 = 60$ degrees.
						2.2	Use a calculator to approximate the value of a trigonometric function.
						2.2	Use circle of radius r to evaluate the trigonometric functions.
						2.3	Determine the domain and the range of the trigonometric functions
						2.3	Determine the period of the trigonometric functions.
						2.3	Determine the signs of the trigonometric functions in a given quadrant.
						2.3	Find the values of the trigonometric functions using fundamental identities.
						2.3	Find the exact values of the trigonometric functions of an angle given one of the functions and the quadrant of the angle.

Chapter 2 TRIGONOMETRIC FUNCTIONS**Section 2.1 – 2.6**

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A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						2.3	Use even-odd properties to find the exact values of the trigonometric functions.
						2.4	Graph functions of the form $y = A \sin (wx)$ using transformations.
						2.4	Graph functions of the form $y = A \cos (wx)$ using transformations.
						2.4	Determine the amplitude and period of sinusoidal functions.
						2.4	Graph sinusoidal functions using key points.
						2.4	Find an equation for a sinusoidal graph.
						2.5	Graph functions of the form $y = A \tan (wx) + B$ and $y = A \cot (wx) + B$.
						2.5	Graph functions of the form $y = A \csc (wx) + B$ and $y = A \sec (wx) + B$.
						2.6	Graph sinusoidal functions: $y = A \sin(\omega x - \phi) + B$.
						2.6	Find a sinusoidal function from data.

Chapter 3 ANALYTIC TRIGONOMETRY

Section: 3.1 – 3.8

Outcomes: The student will be able to use fundamental trigonometric identities; verify trigonometric identities; solve trigonometric equations; use sum, difference, multiple-angle, and power-reducing, half-angle, product-sum formulas to evaluate trigonometric functions.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						3.1	Find the exact value of the inverse sine, cosine, and tangent functions.
						3.1	Find an approximate value of the inverse sine, cosine, and tangent functions.
						3.1	Use properties of inverse functions to find exact values of certain composite functions.
						3.1	Find the inverse function of a trigonometric function.
						3.1	Solve equations involving inverse trigonometric functions.
						3.2	Find the exact value of expressions involving the inverse sine, cosine, and tangent functions.
						3.2	Know the definition of the inverse secant, cosecant, and cotangent functions.
						3.2	Use a calculator to evaluate $\sec^{-1} x$, $\csc^{-1} x$, and $\cot^{-1} x$.
						3.2	Write a trigonometric expression as an algebraic expression.
						3.3	Use algebra to simplify trigonometric expressions.
						3.3	Establish identities.
						3.4	Use sum and difference formulas to find exact values.
						3.4	Use sum and difference formulas to establish identities.
						3.4	Use sum and difference formulas involving inverse trigonometric functions.
						3.5	Use double-angle formulas to find exact values.
						3.5	Use double-angle and half-angle formulas to establish identities.
						3.5	Use half-angle formulas to find exact values.
						3.6	Express products as sums.

Chapter 3 ANALYTIC TRIGONOMETRY**Section: 3.1 – 3.8**

Outcomes: The student will be able to use fundamental trigonometric identities; verify trigonometric identities; solve trigonometric equations; use sum, difference, multiple-angle, and power-reducing, half-angle, product-sum formulas to evaluate trigonometric functions.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						3.6	Express sums as products.
						3.7	Solve equations involving a single trigonometric function.
						3.8	Solve trigonometric equations quadratic in form.
						3.8	Solve trigonometric equations using identities.
						3.8	Solve trigonometric equations linear in sine and cosine.
						3.8	Solve trigonometric equations using a graphing utility.

Chapter 4 APPLICATIONS OF TRIGONOMETRIC FUNCTIONS**Section: 4.1 – 4.5**

Outcomes: The student will be able to use Law of Sines and Law of Cosines; find area of oblique triangles; represent vectors; perform mathematical operations on vectors; find direction of vectors; find dot products of two vectors and use properties of the dot product.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						4.1	Find the value of trigonometric functions of an acute angle using right triangles.
						4.1	Use the complementary angle theorem.
						4.1	Solve right triangles.
						4.1	Solve applied problems.
						4.2	Solve SAA or ASA triangles.
						4.2	Solve SSA triangles.
						4.2	Solve applied problems.
						4.3	Solve SAS triangles.

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Chapter 4 APPLICATIONS OF TRIGONOMETRIC FUNCTIONS**Section: 4.1 – 4.5**

Outcomes: The student will be able to use Law of Sines and Law of Cosines; find area of oblique triangles; represent vectors; perform mathematical operations on vectors; find direction of vectors; find dot products of two vectors and use properties of the dot product.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						4.3	Solve SSS triangles.
						4.3	Solve applied problems.
						4.4	Find the area of SAS triangles.
						4.4	Find the area of SSS triangles.
						4.5	Find an equation for an object in simple harmonic motion.
						4.5	Analyze simple harmonic motion.
						4.5	Analyze an object in damped motion.
						4.5	Graph the sum of two functions

Chapter 5 POLAR COORDINATES; VECTORY**Section: 5.1 – 5.7**

Outcomes: The student should be able to perform operations with complex numbers; find the zeros of a function; multiply and divide complex numbers written in trigonometric form; find powers and n th roots of complex numbers.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						5.1	Plot points using polar coordinates.
						5.1	Convert from polar coordinates to rectangular coordinates.
						5.1	Convert from rectangular coordinates to polar coordinates.
						5.1	Transform equations from polar to rectangular form.
						5.2	Graph and identify polar equations by converting to rectangular equations.
						5.2	Test polar equations for symmetry.

Chapter 5 POLAR COORDINATES; VECTORY

Section: 5.1 – 5.7

Outcomes: The student should be able to perform operations with complex numbers; find the zeros of a function; multiply and divide complex numbers written in trigonometric form; find powers and n th roots of complex numbers.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						5.2	Graph polar equations by plotting points.
						5.3	Convert a complex number from rectangular form to polar form.
						5.3	Plot points in the complex plane.
						5.3	Find products and quotients of complex numbers in polar form.
						5.3	Use De Moivre’s Theorem.
						5.3	Find complex roots.
						5.4	Graph vectors.
						5.4	Find a position vector.
						5.4	Add and subtract vectors.
						5.4	Find a scalar multiple and the magnitude of a vector.
						5.4	Find a unit vector.
						5.4	Find a vector from its direction and magnitude.
						5.4	Analyze objects in static equilibrium.
						5.5	Find the dot product of two vectors.
						5.5	Find the angle between two vectors.
						5.5	Determine whether two vectors are parallel.
						5.5	Determine whether two vectors are orthogonal.
						5.5	Decompose a vector into two orthogonal vectors.
						5.5	Compute work.

Chapter 5 POLAR COORDINATES; VECTORY**Section: 5.1 – 5.7**

Outcomes: The student should be able to perform operations with complex numbers; find the zeros of a function; multiply and divide complex numbers written in trigonometric form; find powers and n th roots of complex numbers.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						5.6	Find the distance between two points in space.
						5.6	Find position vectors in space.
						5.6	Perform operations on vectors in space.
						5.6	Find the dot product.
						5.6	Find the angle between two vectors.
						5.6	Find the direction angles of a vector.
						5.7	Find the cross product of two vectors
						5.7	Know algebraic properties of the cross product.
						5.7	Know geometric properties of the cross product.
						5.7	Find a vector orthogonal to two given vectors.
						5.7	Find the area of a parallelogram.

Chapter 6 ANALYTIC GEOMETRY

Section: 6.1 – 6.7

Outcomes: The student should be able to write the standard forms of the equations of basic conics, analyze and sketch parabolas, ellipses, and hyperbolas, and eliminate the xy -term in equations of conics and classify conics.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						6.1	Know the names of the conics
						6.2	Analyze parabolas with vertex at the origin.
						6.2	Analyze parabolas with vertex at (h, k) .
						6.2	Solve applied problems involving parabolas.
						6.3	Analyze ellipses with center at the origin.
						6.3	Analyze ellipses with center at (h, k) .
						6.3	Solve applied problems involving ellipses.
						6.4	Analyze hyperbolas with center at the origin.
						6.4	Find the asymptotes of a hyperbola.
						6.4	Work with ellipses with center at (h, k) .
						6.4	Solve applied problems involving hyperbolas.
						6.5	Identify a conic.
						6.5	Use a rotation of axes to transform equations.
						6.5	Analyze an equation using a rotation of axes.
						6.5	Identify conics without a rotation of axes.
						6.6	Analyze and graph polar equations of conics.
						6.6	Convert the polar equation of a conic to a rectangular equation.
						6.7	Graph parametric equations.
						6.7	Find a rectangular equation for a curve defined parametrically.

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Chapter 6 ANALYTIC GEOMETRY**Section: 6.1 – 6.7**

Outcomes: The student should be able to write the standard forms of the equations of basic conics, analyze and sketch parabolas, ellipses, and hyperbolas, and eliminate the xy -term in equations of conics and classify conics.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						6.7	Use time as a parameter in parametric equations
						6.7	Find parametric equations for curves defined by rectangular equations.

Chapter 7 EXPONENTIAL AND LOGARITHMIC FUNCTIONS**Section: 7.1 – 7.7**

Outcomes: The student should be able to recognize, evaluate, and graph exponential and logarithmic functions; rewrite logarithmic functions with different bases; use properties of logarithms to evaluate, rewrite, expand, and condense logarithmic expressions; solve logarithmic and exponential equations; use different logarithmic and exponential formulas to solve real-life problems; fit exponential and logarithmic models to sets of data.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						*7.1	Evaluate exponential functions.
						*7.1	Graph exponential functions.
						*7.1	Define the number e .
						*7.1	Solve exponential equations.
						*7.2	Change exponential expressions to logarithmic expressions and logarithmic expressions to exponential expressions.
						*7.2	Evaluate logarithmic functions.
						*7.2	Determine the domain of a logarithmic function.
						*7.2	Graph logarithmic functions.
						*7.2	Solve logarithmic equations.
						*7.3	Work with the properties of logarithms.
						*7.3	Write a logarithmic expression as a sum or difference of logarithms.

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Chapter 7 EXPONENTIAL AND LOGARITHMIC FUNCTIONS**Section: 7.1 – 7.7**

Outcomes: The student should be able to recognize, evaluate, and graph exponential and logarithmic functions; rewrite logarithmic functions with different bases; use properties of logarithms to evaluate, rewrite, expand, and condense logarithmic expressions; solve logarithmic and exponential equations; use different logarithmic and exponential formulas to solve real-life problems; fit exponential and logarithmic models to sets of data.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
						*7.3	Write a logarithmic expression as a single logarithm.
						*7.3	Evaluate logarithms whose base is neither 10 nor e .
						*7.4	Solve logarithmic equations.
						*7.4	Solve exponential equations.
						*7.4	Solve logarithmic and exponential equations using a graphing utility.
						*7.5	Determine the future value of a lump sum of money.
						*7.5	Calculate effective rates of return.
						*7.5	Determine the present value of a lump sum of money.
						*7.5	Determine the rate of interest or time required to double a lump sum of money.
						*7.6	Find equations of populations that obey the law of uninhibited growth.
						*7.6	Find equations of populations that obey the law of decay.
						*7.6	Use Newton's Law of Cooling.
						*7.6	Use logistic models.
						*7.7	Use a graphing utility to fit an exponential function to data.
						*7.7	Use a graphing utility to fit a logarithmic function to data.
						*7.7	Use a graphing utility to fit a logistic function to data.

Projects Required:

None

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Textbook:

Contact Bookstore for current textbook.

Materials/Equipment Required:

This course requires that the student furnish their own TI-83 or TI84 PLUS graphing calculator.

Attendance Policy:

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

Grading Policy:

A minimum 40% of the course grade shall consist of proctored assessment(s) of which at least 20% of the course grade shall include a comprehensive departmental final exam.

Maximum class size:

Based on classroom occupancy

Course Timeframe:

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

The learning outcomes and competencies detailed in this course meet, or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Project for this course, as sanctioned by the Kansas Board of Regents.

Refer to the following policies:

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

Disability Services Program:

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.