



**COWLEY COLLEGE  
& Area Vocational Technical School**

**COURSE PROCEDURE FOR**

**COLLEGE ALGEBRA WITH REVIEW  
MTH 4421 5 Credit Hours**

**Student Level:**

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

**Catalog Description of the Course:**

**MTH4421 - COLLEGE ALGEBRA WITH REVIEW (5 hrs)**

An alternative course to the traditional College Algebra class which covers the same College Algebra material over a five credit hour span per week instead of three. The extra class time will be spent in review of Intermediate Algebra skills necessary to be successful in College Algebra. This course will transfer as the equivalent of MTH4420 College Algebra. This course requires that the student furnish their TI-83 or TI-83 PLUS graphing calculator.

**Prerequisites:**

A minimum grade of C in MTH4410 or MTH4411, satisfactory course placement assessment, or 17 ACT math score.

**Controlling Purpose:**

This course is designed to help both calculus and non-calculus bound students increase their knowledge with a basic knowledge of how to apply the classical functions of College Algebra to real life problems.

**Learner Outcomes:**

Students completing this course with an A, B, or C will be able to apply computational skills such as reasoning, estimation, and problem solving as they are actually used on the job and in personal lives, and should have skills in recognizing and defining problems, inventing and implementing solutions, and tracking and evaluating results, with respect to the classical functions of College Algebra.

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.

**Core Outcomes:**

The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

**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 material as time allows.

**Bold** items denote course competencies agreed upon by the Kansas Core Outcomes Project

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.

## PREREQUISITES: FUNDAMENTAL CONCEPTS OF ALGEBRA

Outcomes: The student will review concepts of real numbers, exponents, radicals, and basic rules of algebra.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Evaluate algebraic expressions.
						Use mathematical models.
						Find the intersection of two sets.
						Find the union of two sets.
						Recognize subsets of the real numbers.
						Use inequality symbols.
						Evaluate absolute value.
						Use absolute value to express distance.
						Identify properties of the real numbers.
						Simplify algebraic expressions.
						Use the product, quotient, zero-exponent, negative exponent, and power rules for exponents.
						Use the power of a quotient.
						Simplify exponential expressions.
						Use scientific notation.
						Evaluate square roots.
						Simplify radical expressions using the product rule and quotient rule
						Add and subtract square roots.
						Rationalize denominators.
						Evaluate and perform operations with higher roots.

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## PREREQUISITES: FUNDAMENTAL CONCEPTS OF ALGEBRA

Outcomes: The student will review concepts of real numbers, exponents, radicals, and basic rules of algebra.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
							Understand and use rational exponents.
							Add, subtract, and multiply polynomials.
							Use FOIL in polynomial multiplication.
							Use special products in polynomial multiplication.
							Perform operations with polynomials in several variables.
							Factor out the greatest common factor of a polynomial.
							Factor by grouping.
							Factor trinomials.
							Factor the difference of squares.
							Factor perfect square trinomials.
							Factor the sum and difference of two cubes.
							Use a general strategy for factoring polynomials.
							Factor algebraic expressions containing fractional and negative exponents.
							Specify numbers that must be excluded from the domain of a rational expression.
							Simplify rational expressions.
							Multiply and divide rational expressions.
							Add and subtract rational expressions.
							Simplify complex rational expressions.

## EQUATIONS AND INEQUALITIES

**Outcomes:** The student will learn to solve and use linear, quadratic and polynomial equations, equations involving radicals, fractions or absolute values; find intercepts, zeros, and graphical solutions; perform operations with complex numbers and use mathematical models to solve real world application problems.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Plot points in the rectangular coordinate system.
						Graph equations in the rectangular coordinate system.
						Use a graph to determine intercepts.
						Interpret information given by graphs.
						<b>Solve linear equations in one variable.</b>
						<b>Solve linear equations containing fractions.</b>
						<b>Solve rational equations with variables in the denominators.</b>
						Recognize identities, conditional equations, and inconsistent equations.
						Solve applied problems using mathematical models.
						Use linear equations to solve problems.
						<b>Solve a formula for a variable.</b>
						Add and subtract complex numbers.
						Multiply complex numbers.
						Divide complex numbers.
						Perform operations with square roots of negative numbers.
						<b>Solve quadratic equations by factoring, square root property, completing the square, and the quadratic formula..</b>
						Use the discriminant to determine the number and type of solutions.
						Determine the most efficient method to use when solving a quadratic equation
						Solve problems modeled by quadratic equations

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## EQUATIONS AND INEQUALITIES

**Outcomes:** The student will learn to solve and use linear, quadratic and polynomial equations, equations involving radicals, fractions or absolute values; find intercepts, zeros, and graphical solutions; perform operations with complex numbers and use mathematical models to solve real world application problems.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						<b>Solve polynomial equations by factoring.</b>
						<b>Solve equations involving radicals.</b>
						Solve equations with rational exponents.
						<b>Solve equations that are quadratic in form.</b>
						<b>Solve equations involving absolute value.</b>
						Solve problems modeled by equations.
						Use interval notation.
						Find intersections and unions of intervals.
						<b>Solve linear inequalities.</b>
						Recognize inequalities with no solution or all real numbers as solutions.
						Solve compound inequalities.
						<b>Solve absolute value inequalities.</b>

## FUNCTIONS AND GRAPHS

Outcomes: The student will review previously learned concepts of graphing on the x-y coordinate plane and analyzing linear functions, and make real world applications using these skills.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
							Find the domain and range of a relation.
							Determine whether a relation is a function.
							Determine whether an equation represents a function.
							<b>Evaluate a function.</b>
							<b>Graph functions.</b>
							Use the vertical line test to identify functions.
							<b>Obtain information about a function from its graph.</b>
							<b>Identify the domain and range of a function from its graph.</b>
							<b>Identify intercepts from a function's graph.</b>
							<b>Understand and use piecewise functions.</b>
							Identify intervals on which a function increases, decreases, or is constant.
							<b>Use graphs to locate relative maxima or minima.</b>
							Identify even or odd functions and recognize their symmetries.
							<b>Calculate a line's slope.</b>
							Write the point-slope form of the equation of a line.
							<b>Write and graph the slope-intercept form of the equation of a line.</b>
							Graph horizontal or vertical lines.
							Recognize and use the general form of a line's equation.
							Use intercepts to graph the general form of a line's equation.
							<b>Model data with linear functions and make predictions.</b>

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## FUNCTIONS AND GRAPHS

Outcomes: The student will review previously learned concepts of graphing on the x-y coordinate plane and analyzing linear functions, and make real world applications using these skills.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
							<b>Find slopes and equations of parallel and perpendicular lines.</b>
							Interpret slope as rate of change.
							<b>Recognize graphs of common functions.</b>
							<b>Use vertical shifts to graph functions.</b>
							<b>Use horizontal shifts to graph functions.</b>
							<b>Use reflections to graph functions.</b>
							<b>Use vertical stretching and shrinking to graph functions.</b>
							<b>Use horizontal stretching and shrinking to graph functions.</b>
							<b>Graph functions involving a sequence of transformations.</b>
							<b>Find the domain of a function.</b>
							<b>Combine functions using the algebra of functions, specifying domains.</b>
							<b>Form composite functions.</b>
							<b>Determine domains for composite functions.</b>
							<b>Write functions as compositions.</b>
							Verify inverse functions.
							<b>Find the inverse of a function.</b>
							Use the horizontal line test to determine if a function has an inverse function.
							<b>Use the graph of a one-to-one function to graph its inverse function.</b>
							Find the inverse of a function and graph both functions on the same axes.
							Find the distance between two points.

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## FUNCTIONS AND GRAPHS

Outcomes: The student will review previously learned concepts of graphing on the x-y coordinate plane and analyzing linear functions, and make real world applications using these skills.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
							Find the midpoint of a line segment.
							<b>Write the standard form of a circle's equation.</b>
							<b>Give the center and radius of a circle whose equation is in standard form.</b>
							Convert the general form of a circle's equation to standard form.

## POLYNOMIAL AND RATIONAL FUNCTIONS

Outcomes: The student will learn to analyze and graph polynomial functions and solve real-world application problems involving polynomials.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
							<b>Recognize characteristics of parabolas including the vertex.</b>
							<b>Graph parabolas.</b>
							<b>Determine a quadratic function's minimum or maximum value.</b>
							Identify polynomial functions.
							Recognize characteristics of graphs of polynomial functions.
							<b>Determine end behavior.</b>
							<b>Use factoring to find zeros of polynomial functions.</b>
							<b>Identify zeros and their multiplicities.</b>
							<b>Graph polynomial functions.</b>
							Use long division to divide polynomials.

## POLYNOMIAL AND RATIONAL FUNCTIONS

Outcomes: The student will learn to analyze and graph polynomial functions and solve real-world application problems involving polynomials.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Use synthetic division to divide polynomials.
						Evaluate a polynomial using the Remainder Theorem.
						Use the Factor Theorem to solve a polynomial equation.
						Use the rational zero theorem to find possible rational zeros.
						<b>Find zeros of a polynomial function, both real and complex answers (includes fundamental theorem of algebra).</b>
						Solve polynomial equations.
						<b>Find a polynomial function with given zeros.</b>
						<b>Find the domain of rational functions.</b>
						<b>Identify vertical asymptotes.</b>
						<b>Identify horizontal asymptotes.</b>
						Use transformations to graph rational functions.
						<b>Graph rational functions.</b>
						<b>Identify slant asymptotes.</b>
						<b>Solve polynomial inequalities.</b>
						<b>Solve rational inequalities.</b>
						Solve direct variation problems.
						Solve inverse variation problems.
						Solve combined variation problems.
						Solve problems involving joint variation.

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## EXPONENTIAL AND LOGARITHMIC FUNCTIONS

Outcomes: The student will learn the basic properties and graphs of exponential and logarithmic functions.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
							<b>Evaluate exponential functions.</b>
							<b>Graph exponential functions.</b>
							Evaluate functions with base e.
							Use compound interest formulas.
							Change from logarithmic to exponential form.
							Change from exponential to logarithmic form.
							Evaluate logarithms.
							<b>Use basic logarithmic functions.</b>
							Graph logarithmic functions.
							Find the domain of a logarithmic function.
							Use common logarithms.
							Use natural logarithms.
							Use the product rule of logarithms.
							Use the quotient rule of logarithms.
							Use the power rule of logarithms.
							Expand logarithmic expressions.
							Condense logarithmic expressions.
							Use the change-of-base property.
							<b>Use like bases to solve exponential equations.</b>
							<b>Use logarithms to solve exponential equations.</b>
							<b>Use the definition of a logarithm to solve logarithmic equations.</b>
							<b>Use the one-to-one property of logarithms to solve logarithmic equations.</b>
							<b>Solve applied problems involving exponential and logarithmic equations.</b>
							Model exponential growth and decay.
							Use logistic growth models.

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## SYSTEMS OF EQUATIONS AND INEQUALITIES

Outcomes: The student will solve simple linear systems using algebraic substitution, addition, and elimination methods.

A	B	C	D	F	N		Specific Competencies
							Demonstrate the ability to:
							Decide whether an ordered pair is a solution of a linear system.
							<b>Solve linear systems by substitution.</b>
							<b>Solve linear systems by addition.</b>
							Identify systems that do not have exactly one ordered-pair solution.
							Solve problems using systems of linear equations.
							Verify the solution of system of linear equations in three variables.
							<b>Solve systems of linear equations in three variables.</b>
							Solve problems using systems in three variables.
							Recognize systems of nonlinear equations in two variables.
							<b>Solve nonlinear systems by substitution.</b>
							<b>Solve nonlinear systems by addition.</b>
							<b>Graph a linear inequality in two variables.</b>
							<b>Graph a nonlinear inequality in two variables.</b>
							<b>Graph a system of inequalities.</b>

## MAXTRIX SOLUTIONS TO LINEAR SYSTEMS

Outcomes: The student will solve simple linear systems using inverse matrices and determinants.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Write the augmented matrix for a linear system.
						Perform matrix row operations.
						Use matrices and Gaussian elimination to solve systems.
						Use matrices and Gauss-Jordan elimination to solve systems.
						Apply Gaussian elimination to systems without unique solutions.
						Apply Gaussian elimination to systems with more variables than equations.
						Solve problems involving systems without unique solutions.
						Use matrix notation.
						<b>Add and subtract matrices.</b>
						<b>Perform scalar multiplication.</b>
						Solve matrix equations.
						<b>Multiply matrices.</b>
						<b>Find the multiplicative inverse of a square matrix.</b>
						Use inverses to solve matrix equations.
						<b>Evaluate a second-order determinant.</b>
						<b>Solve a system of linear equations in two variables using Cramer's rule.</b>
						<b>Evaluate a third-order determinant.</b>
						<b>Solve a system of linear equations in three variables using Cramer's rule.</b>
						<b>Evaluate higher-order determinants.</b>

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## CONIC SECTIONS

Outcomes: The student will recognize, graph and write equations of conics with center at the origin.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						<b>Graph parabolas with vertices at the origin.</b>
						<b>Write equations of parabolas in standard form.</b>
						<b>Graph parabolas with vertices not at the origin.</b>

### **Projects Required:**

None

### **Text Book:**

Contact Bookstore for current text.

### **Materials/Equipment needed:**

TI-83 or TI-83 PLUS graphing calculator

A graphing calculator is required for this course. Instructors are encouraged to cover the initial review material on solving linear, rational and quadratic equations, using various methods by having students show their work. [Chapter 1 in the current text.] Though calculator programs on factoring, solving equations, completing the square and more are available, instructors are discouraged from introducing these programs to students at this time.

### **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:**

20

### **Course Time Frame:**

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.

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**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.