

# MAT194 - College Algebra for STEM

## Course Objectives

### **1. Review Objectives – Students should be proficient with these concepts. As such, only a short amount of time in class will be spent reviewing them.**

Classify real numbers

Use properties of real numbers

Use properties of negatives

Add, subtract, multiply, and divide fractions

Graph numbers on the real line.

Work with set and interval notation

Find and use absolute values of real numbers

Simplify expressions using the laws of exponents

Write numbers in scientific notation

Add and subtract polynomials

Multiply algebraic expressions

Use the Special Product Formulas

Factor out common factors

Factor trinomials

Solve linear equations in one variable

Solve power equations

Solve for one variable in terms of others

Solve problems about interest, about areas and lengths, about mixtures and concentrations

Graph ordered pairs in the coordinate plane

Graph equations by plotting points

Graph equations by intercept method

Find the slope of a line

Find the point-slope form of the equation of a line

Find the slope-intercept form of the equation of a line

Find equations of horizontal and vertical lines

Solve a system of two linear equations in two variables by graphing.

Solve a system of two linear equations in two variables using the substitution and elimination methods.

Use systems of two linear equations to solve applied problems.

### **2. Primary Objectives – These are the course – level objectives.**

Simplify expressions involving radicals

Simplify expressions involving rational exponents.

Express radicals using rational exponents.

Rationalize a denominator

Factor Difference of Squares, Difference of Cubes, and Sum of Cubes

Find the domain of a rational expression

Simplify rational expressions

## Course Objectives (cont.)

Multiply and divide rational expressions  
Add and subtract rational expressions  
Simplify complex fractions  
Rationalize a denominator or numerator  
Solve problems related to uniform motion  
Solve quadratic equations by factoring, by completing the square and using quadratic formula  
Model with quadratic equations  
Solve basic polynomial equations, equations involving radicals, and equations of quadratic type  
Define a complex number  
Add and subtract complex numbers  
Find complex roots of quadratic equations  
Multiply and divide complex numbers  
Solve applied problems modeled with these equations.  
Solve linear and quadratic inequalities  
Solve absolute value equations and absolute value inequalities  
Find the length of a line segment.  
Find the midpoint of a line segment.  
Identify equation of a circle  
Graph circles in a coordinate plane  
Use a graphing calculator to graph equations  
Find equations for parallel and perpendicular lines  
Model with linear equations: interpret slope as a rate of change  
Find equations for direct variation  
Find equations for inverse variation  
Find equations for joint variation  
Use these concepts to solve applied problems involving variation  
Define a function  
Recognize functions in the real world  
Define domain and range of a function  
Represent functions verbally, algebraically, graphically, and numerically  
Graph functions by plotting points and by using a graphing utility  
Graph piecewise defined functions  
Use the vertical line test to identify functions  
Determine whether an equation defines a function  
Find the domain and range of a function from a graph  
Find where a function is increasing or decreasing from a graph  
Find local maxima and minima of functions from a graph  
Find the average rate of change of a function  
Interpret average rate of change in real-world situations  
Recognize that a function with constant average rate of change is linear  
Shift graphs vertically and horizontally  
Stretch or shrink graphs vertically or horizontally  
Determine whether a function is odd or even

Find the sum or difference of two functions and the corresponding domain.

### **Course Objectives (cont.)**

Find the product or quotient of two functions and the corresponding domain.

Find the composition of two functions

Find the domain of a composite function.

Determine whether a function is one-to-one

Find the inverse function of a one-to-one function

Express quadratic function in standard form and graph the function

Apply quadratic function to real world problems

Use synthetic division to divide polynomials

Use the Remainder Theorem to find values of polynomials

Define a rational function

Define and graph exponential functions

Evaluate and graph the natural exponential function

Use exponential functions to solve application problems

Define a logarithmic function: in logarithmic form and its equivalent exponential form

Graph logarithmic functions

Convert between exponential and logarithmic forms.

Define the various properties of logarithms.

Use the properties of logarithms to expand a log expression, and vice versa.

Use the Change of Base Formula

Solve exponential equations algebraically and graphically on the calculator.

Solve logarithmic equations algebraically and graphically on the calculator.

Solve applied problems involving exponential and logarithmic equations

Solve systems of linear equations in three variables.

Use systems of three equations to solve applied problems.

Solve systems of equations using matrices.

Evaluate determinants of square matrices.

Use Cramer's rule to solve systems of equations.

Graph systems of linear inequalities.

Use linear programming to solve applied problems.

Decompose rational expressions into partial fractions in the following cases.

- Denominator contains distinct linear factors.
- Denominator contains repeated linear factors.
- Denominator contains irreducible quadratic factors, none of which is repeated.
- Denominator has a repeated irreducible quadratic factor.

Define an ellipse

Graph ellipses centered at the origin and away from the origin

Define a hyperbola

Graph hyperbolas centered at the origin and away from the origin

Define a parabola

Graph parabolas centered at the origin and away from the origin

Solve applied problems involving conic sections

# **MAT 194 – College Algebra for STEM**

## **Student Learning Outcomes**

After completing this course, the students will know and be able to:

- Demonstrate mastery of mathematical notation and terminology used in this course.
- Demonstrate knowledge of the fundamental principles including the laws and theorems relevant to course objectives.
- Demonstrate ability to apply concepts to model and solve real-life problems using linear, polynomial, rational, root, exponential and logarithmic equations, and linear programming.
- Demonstrate a clear understanding of concepts of functions, including domain, range, operations, compositions and inverses.
- Demonstrate skills to graph functions and conic sections.
- Demonstrate knowledge, competencies, and thought process to support further study, such as precalculus and beyond.