

## MAT 161 COLLEGE ALGEBRA

### COURSE DESCRIPTION:

Prerequisites: MAT 080 or MAT 090 or satisfactory score on placement test

Corequisites: MAT 161A

This course provides an integrated technological approach to algebraic topics used in problem solving. Emphasis is on applications involving equations and inequalities; polynomial, rational, exponential and logarithmic functions; and graphing and data analysis/modeling. Upon completion, students should be able to choose an appropriate model to fit a data set and use the model for analysis and prediction. This course is designed to satisfy the needs of the Associate in Arts student and does not satisfy the prerequisite for MAT 172. *This course has been approved to satisfy the Comprehensive Articulation Agreement for the general education core requirement in natural sciences/mathematics for the Associate in Arts Degree.* Students may not receive credit for both **MAT 161** and **MAT 171**. Course Hours Per Week: Class, 3. Semester Hours Credit, 3.

### LEARNING OUTCOMES:

1. Students will be able to use techniques of algebra and algebraic formulas to simplify expressions and to manipulate and solve equations and inequalities both analytically and with the use of technology. Students will display proficiency by demonstrating the following competencies:
  - a. State the distance formula and use the equation to solve selected problems.
  - b. Determine whether an equation represents a function.
  - c. Identify the domain and range of selected functions.
  - d. Evaluate selected functions.
  - e. Identify the slope and y-intercept of a line from the standard form for the equation of a line.
  - f. Write the equation of a line given two points, a point and the slope, or a point and a parallel or perpendicular line.
  - g. Identify the center and radius of circles whose equations are in general form.
  - h. Solve both analytically and graphically equations and practical problems that reduce to linear or quadratic form.
  - i. Solve formulas for specified variables.
  - j. Find the composition of two functions and identify the domain of the resulting composite function.
  - k. Perform operations with complex numbers.
  - l. Use the Remainder Theorem and the Factor Theorem to factor and solve polynomial equations and identify the multiplicity of each zero.
  - m. Solve both analytically and graphically polynomial, radical, rational, and absolute value equations and equations that involve rational exponents.
  - n. Solve both analytically and graphically linear, polynomial, rational, and absolute value inequalities.
  - o. Solve problems involving direct, inverse, combined and joint variation.
  - p. Determine whether a function is invertible and if it is invertible, find the inverse function and its domain.
  - q. Define an exponential equation.
  - r. Solve exponential equations both analytically and graphically.
  - s. Define a logarithmic equation.
  - t. Solve logarithmic equations both analytically and graphically.
  - u. Use properties of logarithms to expand and condense logarithmic expressions.
  - v. Solve applied problems involving exponential growth and decay.

2. Students will be able to explain the relationship between algebra and geometry by recognizing and analyzing the graph of a function from its equation, and graphing the function by hand and verifying the results using a graphing utility. Students will display proficiency by demonstrating the following competencies:
  - a. Graph equations with a graphing calculator, making appropriate choices for the viewing window.
  - b. Identify and sketch the common graphs of the constant function, the identity function, the quadratic function, the cubic function, the square root function, the cube root function, and the absolute value function.
  - c. Identify intervals over which functions are increasing and decreasing.
  - d. Identify selected functions as odd, even or neither.
  - e. Sketch the graphs of selected functions using the techniques of shifting, stretching, compressing, and reflecting.
  - f. Evaluate and graph piecewise-defined functions.
  - g. Write the equations and graph polynomial functions and identify the domain, the range, the x-intercepts, the y-intercept, and any maximum or minimum points.
  - h. Write the equations and graph selected rational functions and identify the horizontal, vertical, and oblique asymptotes, the x-intercepts, the y-intercept, the domain and the range.
  - i. Write the equations and graph selected exponential functions and identify the horizontal asymptote, the y-intercept, the domain, and the range.
  - j. Write the equations and graph selected logarithmic functions and identify the vertical asymptote, the x-intercept, the domain, and the range.
3. Students will be able to solve practical problems by choosing an appropriate model for the problem and using the model to analyze the situation and make predictions. Students will display proficiency by demonstrating the following competencies:
  - a. Use a graphing utility to construct a scatter diagram, analyze data, find a curve of best fit and make predictions regarding the data.
  - b. Use all of the above techniques and skills to model and pose solutions to real life problems.

### **OUTLINE OF INSTRUCTION:**

- I. Equations and Inequalities
  - A. Linear Equations
  - B. Applications and Modeling with Linear Equations
  - C. Complex Numbers
  - D. Quadratic Equations
  - E. Applications and Modeling with Quadratic Equations
  - F. Other Types of Equations
  - G. Inequalities
  - H. Absolute Value Equations and Inequalities

- II. Graphs and Functions
  - A. Graphs of Equations
  - B. Functions
  - C. Linear Functions
  - D. Equations of Lines; Curve Fitting
  - E. Graphs of Basic Functions
  - F. Graphing Techniques
  - G. Function Operations and Composition
  
- III. Polynomial and Rational Functions
  - A. Quadratic Functions and Models
  - B. Synthetic Division
  - C. Zeros of Polynomial Functions
  - D. Polynomial Functions: Graphs, Applications, and Models
  - E. Rational Functions: Graphs, Applications, and Models
  - F. Variation
  
- IV. Exponential and Logarithmic Functions
  - A. Inverse Functions
  - B. Exponential Functions
  - C. Logarithmic Functions
  - D. Evaluating Logarithms and the Change-of-Base Theorem
  - E. Exponential and Logarithmic Equations
  - F. Applications and Models of Exponential Growth and Decay

**REQUIRED TEXTBOOK:**

Lial, Margaret L., John Hornsby, and David I. Schneider. Essentials of College Algebra. Alternate Ed. Addison Wesley, 2008.

**CALCULATOR:**

TI-83/84 Graphing Calculator

**STATEMENT FOR STUDENTS WITH DISABILITIES:**

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 536-7207, ext. 1413 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.