

MTH 165 COLLEGE ALGEBRA – Course Objectives (revised 3/26/2004)

Creating open expressions and using those expressions to write equations involving one or two variables to solve problems and applications will be integrated throughout this course (especially in * topics). Examples from other disciplines will be incorporated whenever possible. A comprehensive departmental final exam testing the degree of mastery of the following course objectives is required.

1. Sets of Numbers

- 1.1 Review classifying a given real number as being a counting or natural number, whole number, integer, rational or irrational number.
- 1.2 Review the concept of complex numbers.
- 1.3 Review writing complex numbers in $a + bi$ form; review adding, subtracting, multiplying, and dividing complex numbers in $a + bi$ form.

***2. Equation Solving Techniques**

- 2.1 Review solving linear equations and formulas for a single variable.
- 2.2 Solve quadratic equations in one variable.
 - 2.2a Review solving by factoring
 - 2.2b Review solving by the Square Root Method
 - 2.2c Review solving by completing the square on $ax^2 + bx + c = 0$ where $a = 1$
 - 2.2d Solve by completing the square on $ax^2 + bx + c = 0$ where $a \neq 1$
 - 2.2e Review solving by the quadratic formula
 - 2.2f Review using the discriminant to classify the roots
- 2.3 Review solving rational equations.
- 2.4 Solve radical equations.
 - 2.4a Review solving radical equations with one radical term
 - 2.4b Solve radical equations with at most two radical terms
- 2.5 Solve equations involving direct, joint, and/or inverse variation.
- 2.6 Solve equations involving rational exponents.
- 2.7 Solve equations that are quadratic in form.

3. Polynomials

- 3.1 Review multiplication and division of polynomials.
- 3.2 Perform synthetic division using rational divisors.
- 3.3 Use synthetic division to find the quotient and remainder of the polynomial function $P(x)$ when $P(x)$ is divided by $x - c$, to determine whether a given number is a zero of $P(x)$, and to determine whether $x - c$ is a factor of $P(x)$.
- 3.4 Use the Remainder Theorem to find remainder $P(c)$ when a polynomial function $P(x)$ is divided by $x - c$.
- 3.5 Use the Fundamental Theorem of Algebra to find a polynomial function $P(x)$ with n given zeros.
- 3.6 Given a polynomial function and some of its zeros, find the remaining zeros.
- 3.7 Use the Rational Zero Theorem to find the rational zeros of a polynomial function with integer coefficients.

4. Factoring

- 4.1 Review factoring techniques, including GCF factoring, factoring by grouping, factoring the difference of two squares, factoring trinomials of the form $ax^2 + bx + c$, factoring perfect square trinomials, and factoring the sum and difference of two cubes.

5. Rational Expressions

- 5.1 Review arithmetic operations on rational expressions.
- 5.2 Review simplification of complex fractions.

6. Inequalities in one variable

- 6.1 Review solving compound linear inequalities, expressing the solution using set-builder notation, interval notation, and on the real number line.
- 6.2 Solve factorable quadratic inequalities, and inequalities involving rational expressions, expressing the solution using set-builder notation, interval notation, and on the real number line.

*7. Absolute Value

- 7.1 State the definition of absolute value.
- 7.2 Review solving a linear absolute value equation in one variable.
- 7.3 Review solving a linear absolute value inequality in one variable, expressing the solution using set-builder notation, interval notation, and on the real number line.

*8. Functions

- 8.1 Determine whether a relation is a function.
- 8.2 Find the domain of a given function algebraically.
- 8.3 Find the domain and range of a function from its graph.
- 8.4 Determine algebraically and graphically whether a given relation is a function.
- 8.5 Review the use of function notation.
- 8.6 Perform combinations of functions $(f + g, f - g, f \cdot g, f/g)$
- 8.7 Find the composition of functions $(f \circ g)$
- 8.8 Determine whether a given function is one-to-one.
- 8.9 Given a one-to-one function $f(x)$, find the inverse function, $f^{-1}(x)$, algebraically and graphically.
- 8.10 Determine the zeros of a function.

*9. The Cartesian Coordinate System

- 9.1 Review writing the equation of a line using the slope-intercept form and the point-slope form.
- 9.2 Use the vertex, axis of symmetry, and intercepts to graph a quadratic function of the form $f(x) = ax^2 + bx + c$ (REVIEW) or $f(x) = a(x-h)^2 + k$ (NEW).
- 9.3 Given the equation of a circle, determine the center and radius, and use these to sketch the graph of the circle.
- 9.4 Determine algebraically and graphically whether the graph of a given equation is symmetric with respect to the x-axis, y-axis, and/or origin.
- 9.5 Identify the graphs of the following types of functions: linear, quadratic, cubic, absolute value, square root, exponential, and logarithmic.
- 9.6 Use translations to sketch a graph which is a horizontal and/or vertical shift from a graph of the following types of functions: linear, quadratic, cubic, absolute value, square root, exponential, and logarithmic.
- 9.7 Graph the following non-linear equations in two variables using intercepts and by obtaining a finite number of ordered pairs:
 - Absolute value functions
 - Equations of the type $x = ay^2 + by + c$
- 9.8 Graph piece-wise functions with constant, linear, and/or quadratic pieces.
- 9.9 Review graphing a linear inequality in two variables.
- 9.10 Graph a quadratic inequality of the form $y > ax^2 + bx + c$ (also $<$, \geq , \leq).
- 9.11 Sketch the graphs of polynomial functions of no more than fourth degree.

***10. Systems of Equations**

- 10.1 Solve linear-quadratic systems of equations in two variables algebraically.
- 10.2 Solve linear-quadratic systems of equations in two variables graphically.
- 10.3 Solve systems of two quadratic equations in two variables graphically.
- 10.4 Solve systems of linear and/or quadratic inequalities in two variables graphically.

11. Exponents and Radicals

- 11.1 Review simplifying exponential expressions with rational exponents.
- 11.2 Review simplifying radical expressions.
- 11.3 Review performing arithmetic operations on radical expressions.

***12 Exponential and Logarithmic Functions**

- 12.1 Define exponential functions of the form $f(x) = a(b^{cx})$, $b > 0$, $b \neq 1$, $c > 0$.
- 12.2 Graph equations of the form $f(x) = a(b^{cx})$, $b > 0$, $b \neq 1$, $c > 0$.
- 12.3 Graph equations of the form $f(x) = e^{cx}$ and $f(x) = 10^{cx}$, $c > 0$.
- 12.4 Define logarithmic functions of the form $f(x) = a \log_b x$, $b > 0$, $b \neq 1$.
- 12.5 Graph equations of the form $f(x) = a \log_b x$, $b > 0$, $b \neq 1$.
- 12.6 Graph equations of the form $f(x) = \ln x$ and $f(x) = \log x$.
- 12.7 Express logarithmic equations in exponential form.
- 12.8 Express exponential equations in logarithmic form.
- 12.9 Use properties of logarithms to rewrite expressions involving logarithms.
- 12.10 Use a calculator to evaluate common and natural logarithms and antilogarithms.
- 12.11 Solve exponential equations and logarithmic equations.
- 12.12 Solve applied problems involving exponential and logarithmic functions.