New 8/2021

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MDE 60 – INTERMEDIATE ALGEBRA (3 CR.)

Course Description

Presents topics in algebra, including graphing, exponents, radicals, polynomials, rational functions, and complex numbers. Lecture 3 hours. Total 3 hours per week.

General Course Purpose

The general purpose of this one-semester course is to help students develop a foundation in algebra skill required for success in MTH 161 with MDE 61. Instructors are encouraged to employ a combination of direct instruction, guided practice, and individualized support to prepare students for subsequent mathematics coursework.

Course Prerequisites/Corequisites

Prerequisites: MDE 10 or equivalent, any three MTE units 1-9.

Course Objectives

Demonstrate comprehension of the major topics listed below. Apply learned concepts and success skills toward continued progress in MTH 161 with co-requisite.

- Algebra
    - Solve first degree equations using the Addition Property and the Multiplication Property of Equality.
    - Solve first degree equations in one variable with the variable on both sides of the equal sign.
    - Solve formulas using the Addition Property and the Multiplication Property of Equality.
    - Solve first degree inequalities in one variable stating the solution using inequality and interval notation.
    - Solve first degree inequalities in one variable and graph the solution on a real number line.
- Graphing and Equations
    - Find the equation of the line passing through two ordered pairs.
    - Graph equations of lines, including horizontal lines, vertical lines, and lines in slope-intercept form.
    - Graph a linear inequality in two variables.
    - Find the slope of a line given two points on the line.
    - Find the slope of a line given its equation in general or slope-intercept form.
    - Write an equation of a line in slope-intercept form given the slope and the y-intercept.
    - Write an equation of a line in slope-intercept form given the slope and a point on the line.
    - Write an equation of a line in slope-intercept form given two points on the line.
    - Evaluate $y = f(x)$ for specific values of x.
    - Given the graph of $y = f(x)$, evaluate $f(x)$ for specific values of x.
    - Given the graph of $y = f(x)$, find x for specific values of $f(x)$.
    - Given the equation of $y = f(x)$, find x for specific values of $f(x)$.
- Exponents
    - Use the product rule to simplify expressions containing exponents.
    - Use the quotient rule to simplify expressions containing exponents.
    - Use the power rule to simplify expressions containing exponents.
    - Use and apply negative exponents.
    - Multiple two monomials.
    - Divide two monomials.
    - Evaluate expressions containing products, quotients, power of a power, and negative exponents.

    - Multiply/divide numbers in scientific notation.
- Radicals
    - Convert between square root and $a^{1/2}$ forms.
    - Convert between nth root and $a^{1/n}$ forms.
    - Calculate square roots and nth roots via calculator.
    - Simplify using the properties of rational exponents.
    - Simplify radicals by using the multiplication property of radicals.
    - Combine and simplify like radicals.
    - Multiply and simplify radicals.
    - Simplify radicals by rationalizing a denominator with one or two terms.
    - Solve radical equations.
- Polynomials
    - Identify an expression as a monomial, binomial, trinomial, or polynomial.
    - Add, subtract, multiply and divide monomials using the rules of exponents.
    - Add, subtract, and multiply polynomials.
    - Divide polynomials using long division.
    - Divide polynomials using synthetic division.
    - Find the greatest common factor from a list of terms.
    - Factor a polynomial by finding the greatest common factor.
    - Factor a polynomial by grouping.
    - Factor trinomials of the form $x^2 + bx + c$.
    - Factor trinomials of the form $ax^2 + bx + c$, $a \neq 1$.
    - Factor a difference of squares.
    - Factor a sum of two cubes.
    - Factor a difference of two cubes.
    - Solve polynomial equations using factoring techniques.
- Complex Numbers
    - Define $i = \sqrt{-1}$
    - Define imaginary numbers (e.g. $\sqrt{-25}$).
    - Simplify square roots of negative numbers using the imaginary unit.
    - Add, subtract, multiply complex numbers.
- Quadratics
    - Describe the roots of a quadratic based upon the discriminant in all cases.
    - Find the roots of quadratic equations of the form $ax^2 + c = 0$.
    - Find the roots of quadratic equations of the form $ax^2 + bx + c = 0$.
    - Determine whether the parabola opens upward or downward.
    - Use completing the square to write a quadratic expression in the form$a(x - h)^2 + k$.
    - Find the vertex of a quadratic equation $y = ax^2 + bx + c$.
    - Determine the axis of symmetry for a parabola.
    - Graph a parabola using intercepts, vertex, and axis of symmetry.
- Rational Functions and Expressions
    - Find the x-values for which a rational expression is undefined.
    - Simplify a rational algebraic expression.
    - Perform addition and subtraction of rational algebraic expressions having like denominators.
    - Perform addition and subtraction of rational algebraic expressions having unlike denominators.
    - Perform multiplication and division of rational algebraic expressions with common factors.
    - Perform multiplication and division of rational algebraic expressions without common factors.
    - Simplify complex fractions.

Major Topics to be Included

- Properties of exponents
- Polynomials

- Factoring
- Solving quadratics and Pythagorean theorem
- Complex numbers
- Graphing (lines and quadratics)
- Linear equations and inequalities
- Linear systems
- Functions
- Rational expressions and equations
- Radical expressions and equations