**Mathematics Department**
**Brooklyn College, City University of New York**

**Math 1011 (Precalculus) Syllabus**
4 hours, 3 credits

## Prerequisites

- Real Numbers and Their Properties**-** Types of Real Numbers, Operations on Real Numbers, Properties of Real Numbers,
- The Real Number Line and Order**-** The Real Line, Order on the Real Line, Sets and Intervals, Absolute Value and Distance
- Integer Exponents**-** Exponential Notation, Rules for Working with Exponents
- Rational Exponents and Radicals**-** Radicals, Rational Exponents, Rationalizing the Denominator
- Algebraic Expressions**-** Adding and Subtracting Polynomials, Multiplying Algebraic Expressions, Special Product Formulas
- Factoring**-** Factoring Trinomials, Special Factoring Formulas, Factoring an Expression Completely
- Rational Expressions**-** Multiplying, Dividing, Adding and Subtracting Rational Expressions, Simplifying Rational Expressions

## Equations and Inequalities

- Basic Equations**-** Solving Linear Equations, Solving Power Equations, Solving for one variable in terms of the other,
- Quadratic Equations**-** Solving Quadratic Equations by Factoring, Completing the Square, the Quadratic Formula,
- Complex Numbers**-** Arithmetic Operations of Complex numbers, Square Roots of Negative Numbers, Complex Solutions of Quadratic Equations
- Absolute Value Equations and Inequalities- Solving an Absolute Value Equation, Properties of Absolute Inequalities

## Coordinates and Graphs

- The Coordinate Plane**-** Distance and Midpoint Formulas,
- Graphs of Equations in Two Variables**-** Graphing Equations by plotting point, Intercepts, Circles, Symmetry
- **Lines-** Slope of a Line, Equations of a line**-** Point-Slope Form, Slope-Intercept Form, Vertical, Horizontal, Parallel, and Perpendicular Lines, General Equation of a Line, Slope as Rate of Change

## Functions

- Definition of a Function-- Domain, Range, Graphs of Functions,
- Getting Information from the Graph of a Function,
- Average rate of Change of a Function,
- Transformations of Functions,
- Combining Functions--Sums, Differences, Products, Quotients,
- Composition of Functions,
- One-to-One Functions and their Inverses

## Polynomial and Rational Functions

- Quadratic Functions--Graphing Quadratic Functions Using the Standard Form, Maximum and Minimum Values of Quadratic Functions,
- Polynomial Functions and Their Graphs-- Dividing Polynomials, Real Zeros of Polynomials,
- Complex Zeros and the Fundamental Theorem of Algebra,
- Rational Functions and Their Graphs-- Asymptotes, Intercepts, End-behavior

## Exponential and Logarithmic Functions

- Exponential Functions**--** The Natural Exponential Function,
- Laws of Logarithms--Exponential and Logarithmic Equations

## Systems of Equations and Inequalities

- System of Linear Equations in two Variables--Substitution, Elimination, and Graphical Methods
- Systems of Non-linear Equations-- Substitution, Elimination, and Graphical Methods

## Trigonometric Functions

- Angle Measure--Degrees and Radians, Angles in Standard Position, the Unit Circle, Length of Circular Arc,
- Trigonometry of Right Triangles--Trigonometric Ratios, Trigonometric Functions of Angles—
- Trigonometric Identities,
- Inverse Trigonometric Functions and Right Triangles,
- Laws of Sines and Cosines,
- Trigonometric Graphs—Graphs of Sine, Cosine, Tangent, Cotangent, Secant and Cosecant,
- Inverse Trigonometric Functions and their Graphs

## Analytic Trigonometry

- Simplifying Trigonometric Expressions,
- Proving Trigonometric Identities,
- Sum and Difference of two Angles, Double Angle, Half Angle,
- Solving Basic Trigonometric Equations,
- Equations with Trigonometric Functions of Multiples of Angles

## Conic Sections

- Parabolas—Geometric Definition of a Parabola, Equations and Graphs of Parabolas
- Ellipses-- Geometric Definition of an Ellipse, Equations and Graphs of Ellipses, Eccentricity of an Ellipse
- Hyperbolas—Geometric Definition of a Hyperbola, Equations and Graphs of Hyperbolas
- Shifted Conics—Shifting Graphs of Equations, Shifted Parabolas, Shifted Ellipses, Shifted Hyperbolas,
- General Equation of a shifted Conic

## The Binomial Theorem

- Expanding $(a+b)^n$, the Binomial Coefficients, the Binomial Theorem, General Term of the Binomial Expansion