1 Warning

Community College of Philadelphia is a firm adherent to the principle of academic freedom. In light of this, faculty are not required to follow a particular approach or a particular textbook for the courses they teach. Most faculty, however, have more or less uniform guidelines for specific courses, and indeed, many use a particular textbook or approach in order to conform to area institutions. Therefore, the sample syllabus found here is not binding to faculty, but represents a synthesis of what most faculty do or aspire to do when they teach a particular course. What follows should not be interpreted as a prescription, but rather, as a means to help the placement of our students in transfer institutions.

2 Catalogue Description

Functions and their applications to algebra, real numbers, distance and locus problems in the plane, polynomial functions, graphs of functions, inverse functions, rational functions, their zeros and poles. Prerequisite: MATH 118 with a grade of C or better.

3 Allotted Time

Math 161 is a **3**-credit course. Courses at Community College of Philadelphia run for about **42 55**-minute periods. Instructors usually give three or four exams (generally lasting at least **55** minutes), and a **2**-hour long final exam.

4 Topics Outline

- The Real Line: Intervals and non-linear inequalities.
- The Coordinate Plane: Sets on the plane. The distance formula. Circles.
- Equations and Graphs: Symmetry of Curves.
- Functions: Definitions. Natural Domain of a Function. Even and odd functions.
- Linear Functions: Equations of lines. Equations of parallel and normal lines.
- Quadratic Functions: Discriminant characterization of quadratics. Translations and distortions of parabolas.
- The Absolute Value, The Square Function, and the Greatest Integer Function: Their canonical graphs and transformations of their graphs.
- Arithmetic Combination of Functions: Sums, differences, products and quotients of functions. Characterization of the domains of arithmetic combinations of functions.
- Composition of Functions: Characterization of the domain of the composite function. Factorization of a function in terms of elementary functions. Graphs of compositions with the absolute value function.

- Inverse Functions: Injective and Surjective Functions. Criteria for invertibility. Graph of the inverse function.
- Polynomial Functions: Graphs of polynomial functions splitting in the real field.
- Finding Factors and Zeros of Polynomials: Ruffini's factor theorem.
- Rational Functions: Graphs of rational functions whose numerators and denominators are polynomials splitting on the real field.
- Other Algebraic Functions: Square root function. Cubic root function. Combinations of these functions.
- Complex Roots of Polynomials: Arithmetic operations with complex numbers.

5 Competencies

1. The Student will demonstrate knowledge of the Real Line and the Cartesian Plane by
   (a) computing intersections, unions, and differences of intervals
   (b) graphing Cartesian products of intervals on the plane
   (c) expressing the solution set of non-linear inequalities in interval notation
   (d) expressing the sum of absolute values of linear expressions without absolute values
2. The Student will demonstrate understanding of the concept of a function by
   (a) determining all functions from a finite set to another finite set
   (b) identifying the domain, the target set, and image of a function given a particular function
   (c) performing various algebraic operations with functions
   (d) performing the composition of two or more functions
   (e) noticing how various rigid transformations and distortions affect the graph of a function
   (f) explaining the concept of invertibility of a function and the relationship of the graph of an invertible function with the function
3. The Student will demonstrate knowledge of piecewise defined functions by:
   (a) Defining piecewise defined functions.
   (b) Graphing piecewise defined functions.
4. The student will demonstrate an understanding of polynomial functions by
   (a) analyzing the graph of a polynomial function, its behavior near its zeros and its end behavior.
   (b) using the appropriate theorems of polynomials to factor a polynomial function and find all its zeros.
   (c) stating the Fundamental Theorem of Algebra.

(d) using appropriate rules or theorems to determine the existence, location and classification of the zeros of a polynomial function.

(e) using the appropriate theorems of polynomials to build a polynomial function given its zeros or its graph.

(f) graphing polynomial functions.

5. The student will demonstrate an understanding of rational functions by

(a) graphing rational functions which have asymptotes including vertical, horizontal and oblique.

(b) analyzing the behavior of the graph of a rational function about a point of discontinuity.

6. The student will explore other algebraic functions by

(a) graphing transformations of a function given its graph or its equation.

(b) graphing piecewise functions that include nonlinear pieces.

(c) constructing and graphing functions that model real life applications and solving related problems.