

Syllabus - Math 160 - Precalculus

Department of Mathematics
Millersville University

Description

Math 160 is designed for students who intend to continue into calculus, who are not adequately prepared to begin their mathematics sequence with Calculus I (Math 161). It covers topics in which beginning calculus students are often deficient: elementary functions, curve sketching, theory of equations, inequalities, trigonometry and analytic geometry. Math 160 does not count for credit toward the math major.

Prerequisites and General Education Credit

The prerequisites are either: (a) Completion of Math 101 with a grade of C- or better, or (b) Math Placement into MATH 160 prior to registration.

Math 160 counts toward the G2 block in the General Education Curriculum and satisfies the Foundations for Lifelong Learning Mathematics Requirement.

Objectives

Students will demonstrate that they:

- Can correctly use mathematical notation and terminology.
- Understand the properties of algebraic, trigonometric, logarithmic, and exponential functions, and can use their understanding to solve applied problems.
- Can use a graphing calculator appropriately to experiment and to confirm.

Course Outline

Topics may be covered in a different order than listed below at the instructor's discretion, as long as all the topics are covered during the course. However, instructors should plan to begin trigonometry no earlier than the 10th week of the term, to accommodate students who are concurrently enrolled in Math 110.

Calculator Use

Students are required to have access to a graphing calculator, preferably one supported by the department (the TI 83/83+, 84, or 86). Instructors will ensure that students have learned how to use the calculator to graph functions. Calculator instruction should conform to the department's policies, which state:

- Graphical and numerical evidence should be presented as an aid to conjecture and comprehension. They should not be a substitute for rigorous proof, nor should they replace the acquisition of appropriate symbolic manipulation skills.
- Students should understand the limitations of technology (for example, by seeing situations in which graphical or numerical evidence is unreliable or inconclusive).

In MATH 160, the instructor will demonstrate and students will learn to use calculators to investigate the graphs of functions. Instructors should use their discretion in deciding how they teach this skill.

List of Topics

Midpoint Formula, Distance Formula, and Equation of Circle

Graphs, Lines, and Functions

1. Functions
2. Transformations of functions
3. Composite functions
4. Inverse functions
5. Variation (Recommended if time permits)

Polynomials and Rational Functions

1. Quadratic functions
2. Polynomial functions of higher degree (Note: Instructors are not required to cover synthetic division)
3. Complex numbers
4. Roots of polynomial functions
5. Rational functions
6. Nonlinear inequalities

Exponential Functions and Logarithms

1. Exponential functions
2. Logarithmic functions
3. Properties of logarithms
4. Exponential and logarithmic equations
5. Applications of exponential and logarithmic functions

Trigonometry

1. Radian and degree measure
2. Trigonometric functions and the unit circle
3. Right triangle trigonometry
4. Trigonometric functions of arbitrary angles
5. Graphs of trigonometric functions
6. Inverse trigonometric functions
7. Applications of trigonometric functions
8. Trigonometric identities
9. Solving trigonometric equations
10. Sum and difference formulas
11. Multiple-angle formulas (Note: Instructors are not required to cover product-to-sum formulas)

Conics (Recommended if time permits)

1. Parabolas
2. Ellipses
3. Hyperbolas

Recent Texts

Larson, Ronald, Precalculus: A Concise Course (3rd edition). Boston, MA: Houghton Mifflin Company, 2014.

The text may be accompanied by online homework.

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Appendix

The following sample syllabus refers to the appropriate sections in the text by Larson.

Midpoint, Distance Formula, and Equation of Circle (1.2)

Functions (1.4)

Analyzing graphs of functions (1.5)

A library of parent functions (1.6)

- This section discusses the functions $f(x) = ax + b$, $f(x) = x^2$, $f(x) = x^3$, $f(x) = \sqrt{x}$, $f(x) = 1/x$, step functions, and piecewise-defined functions.

Transformations of functions (1.7)

Combinations of functions: Composite functions (1.8)

Inverse functions (1.9)

Mathematical modeling and variation (1.10) (Recommended if time permits)

Quadratic functions and models (2.1)

Polynomial functions of higher degree (2.2)

Polynomials and synthetic division (2.3) (Note: Instructors are not required to cover synthetic division.)

Complex numbers (2.4)

Zeros of polynomial functions (2.5)

Rational functions (2.6)

Nonlinear inequalities (2.7)

Exponential functions and their graphs (3.1)

Logarithmic functions and their graphs (3.2)

Properties of logarithms (3.3)

Exponential and logarithmic equations (3.4)

Exponential and logarithmic models (3.5)

Radian and degree measure (4.1)

Trigonometric functions: the unit circle (4.2)

Right triangle trigonometry (4.3)

Trigonometric functions of any angle (4.4)

Graphs of sine and cosine functions (4.5)

Graphs of other trigonometric functions (4.6)

Inverse trigonometric functions (4.7)

Applications and models (4.8)

Using fundamental identities (5.1)

Verifying trigonometric identities (5.2)

Solving trigonometric equations (5.3)

Sum and difference formulas (5.4)

Multiple-angle and product-to-sum formulas (5.5) (Note: Instructors are not required to cover product-to-sum formulas)

Introduction to conics: (Recommended if time permits)

parabolas (6.2)

Ellipses (6.3)

Hyperbolas (6.4)