

OFFICIAL SYLLABUS

MATH 531-ALGEBRAIC CONTENT, PEDAGOGY, AND CONNECTIONS

Effective Fall 2012

CATALOG DESCRIPTION: A focused look at algebraic content, best practices in pedagogy, and connections in other areas.

Prerequisites: *MATH 250 or consent of instructor. Within the Department of Mathematics and Statistics, credit can only be earned for the Post-Secondary Mathematics option.*

Textbook: Mathematics for High School Teachers: An Advanced Perspective, By Usiskin, Peressini, Marchisotto, & Stanley

Chapter 1: What is Meant by “An Advanced Perspective”

Chapter 2: Real Numbers and Complex Numbers

- 2.1.1 Rational numbers and irrational numbers
- 2.1.2 The number line and decimal representation of numbers
- 2.1.3 Periods of periodic decimals
- 2.1.4 The distributions of various types of real numbers
- 2.2.1 The complex numbers and the complex plane
- 2.2.2 The geometry of complex number arithmetic

Chapter 3: Functions

- 3.1.1 What is a function?
- 3.1.2 Problem analysis: from equations to functions
- 3.2.1 Analyzing real functions
- 3.2.2 Composition and inverse functions
- 3.2.3 Monotone real functions
- 3.2.4 Limit behavior of real functions
- 3.3.1 Fitting linear and exponential functions to data
- 3.3.2 Fitting polynomial functions to data
- 3.3.3 An extended analysis of the box problem

Chapter 4: Equations

- 4.1.1 Equality, equivalence, and isomorphism
- 4.1.2 Solving equations
- 4.2.1 Solving equations of the form (equation)
- 4.2.2 Solving equations of the form (equation)
- 4.2.3 Quadratic and other polynomial equations
- 4.3.1 Generalized addition and multiplication properties of equality
- 4.3.2 Applying the same function to both sides of an equation
- 4.3.3 Solving inequalities
- 4.3.4 Extended analysis: averages of speeds

Chapter 5: Integers and Polynomials

- 5.1.1 Recursion and proof by mathematical induction
- 5.1.2 Mathematical induction
- 5.1.3 More applications of mathematical induction
- 5.1.4 An extended analysis of an induction situation
- 5.2.1 The Division Algorithm
- 5.2.2 Divisibility of integers
- 5.2.3 Solving linear Diophantine equations

- 5.2.4 The Fundamental Theorem of Arithmetic
- 5.2.5 Base representation of positive integers
- 5.3.1 The Division Algorithm for polynomials
- 5.3.2 The Euclidean Algorithm and prime factorization for polynomials

Chapter 6 – Number System Structures

- 6.1.1 Integer congruence
- 6.1.2 Applications of integer congruence to calendars and cryptology
- 6.1.3 The Chinese Remainder Theorem
- 6.2.1 Ordered fields
- 6.2.2 Archimedean and complete ordered fields
- 6.2.3 The structure of the complex number system