

**PENN STATE UNIVERSITY
MATH 110: TECHNICAL CALCULUS I**

Text: Brief Calculus, An Applied Approach, 8th ed, 2009

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Course Outline

Chapter 0 A Precalculus Review

- 0.1 The Real Line and Order **
- 0.2 Absolute Value and Distance on the Real Line **
- 0.3 Exponents and Radicals **
- 0.4 Factoring Polynomials **
- 0.5 Fractions and Rationalization **

Chapter 1 THE CARTESIAN PLANE AND GRAPHS

- 1.1 The Cartesian Plane and the Distance Formula (quickly)
- 1.2 Graphs of Equations (quickly)
- 1.3 Lines in the Plane and Slope (quickly)
- 1.4 Functions (quickly)
- 1.5 Limits
- 1.6 Continuity

Chapter 2 DIFFERENTIATION

- 2.1 The Derivative and the Slope of a Graph
- 2.2 Some Rules for Differentiation
- 2.3 Rates of Change: Velocity and Marginals
- 2.4 The Product and Quotient Rules
- 2.5 The Chain Rule
- 2.6 Higher-Order Derivatives
- 2.7 Implicit Differentiation
- 2.8 Related Rates

Chapter 3 APPLICATIONS OF THE DERIVATIVE

- 3.1 Increasing and Decreasing Functions
- 3.2 Extrema and the First-Derivative Test
- 3.3 Concavity and the Second-Derivative Test
- 3.4 Optimization Problems

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(over)

3.5 Business and Economic Applications

3.6 Asymptotes **

3.7 Curve Sketching: A Summary **

3.8 Differentials and Marginal Analysis

Chapter 4 EXPONENTIAL AND LOGARITHMIC FUNCTIONS

4.1 Exponential Functions

4.2 Natural Exponential Functions

4.3 Derivatives of Exponential Functions

4.4 Logarithmic Functions

4.5 Derivatives of Logarithmic Functions

4.6 Exponential Growth and Decay

Chapter 5 INTEGRATION AND ITS APPLICATIONS

5.1 Antiderivatives and Indefinite Integration

5.2 The General Power Rule

5.3 Exponential and Logarithmic Functions

5.4 Area and the Fundamental Theorem of Calculus

5.5 The Area of a Region Bounded by Two Graphs

5.6 The Definite Integral as the Limit of a Sum **

Chapter 6 TECHNIQUES OF INTEGRATION

6.1 Integration by Parts and Present Value

6.5 Improper Integrals

NOTES:

1. Use of calculators (with or without CAS) are up to the discretion of each instructor.
2. All items MUST be covered except those with **.
3. The Final Exam must consist of questions that cover the following topics.

Limits

The definition of a derivative

What a derivative represents (slope, rate of change, marginals, etc.)

First and Second Derivative Tests

Optimization, business and economic applications

The Fundamental Theorem of Calculus

Area between two curves

Integration by parts

Calculus problems involving the exponential and logarithmic functions

Improper Integrals