Review for the First Midterm Exam - Math 124

The primary topics for this exam are **limit**, **continuity**, the **derivative** and their applications.

The sections of the text relevant for this exam are 1.2, 1.3, 1.5, 1.6, 2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 2.8, 3.1, and 3.2.

Here's a summary of each section.

- 1.2 Mathematical Models: A Catalog of Essential Functions

  A review of a number of essential function types: polynomials, rational, algebraic, trigonometric, exponential, logarithmic and transcendental functions.

- 1.3 New Functions from Old Functions

  A review of the notions of shifting, scaling and reflecting.

  I like problems 63-66 especially.

- 1.5 Exponential Functions

  A review of the relevant facts and methods of exponential functions.

  Problem 29 is fun.

- 1.6 Inverse Functions and Logarithms

  A review of inverse functions generally, and logarithmic functions specifically.

- 2.1 The Tangent and Velocity Problems

  Introduces two of the fundamental questions that calculus allows us to solve.

- 2.2 The Limit of a Function

  An important section, this introduces the notion of the **limit**, the most important idea in calculus.

  Problems like 25-32 are good practice.

- 2.3 Calculating Limits Using the Limit Laws

  This important section introduces a number of methods for evaluating limits.

  Problems 3-9, 11-30, and 37-44 are good practice. Problems 60 and 61 are fun, too.

- 2.5 Continuity

  This section introduces the very important notion of continuity.

  You should know the definition of continuity. What does it mean for a function to be continuous at a point? What does it mean for a function to be continuous

everywhere? Can you give an example of a function that is continuous everywhere except at $x = 5$? Can you give an example of a functions that is continuous everywhere except at every integer multiple of 5?

Problems 15-28 are good.

- 2.6 Limits at Infinity: Horizontal Asymptotes

  This chapter presents the notion of limits at infinity.

  A function f is said to have a **horizontal asymptote**, $y = L$ if

  $$\lim_{x \to \infty} f(x) = L$$

  or

  $$\lim_{x \to -\infty} f(x) = L.$$

  Problems 15-36, 39-44 are all good.

- 2.7 Derivative and Rates of Change

  The **derivative** is introduced.

  Problems 51 and 52 are interesting.

- 2.8 The Derivative as a Function

  This section extends the notion of the derivative "at a point" to the derivative as a function.

  Higher order derivatives are also introduced.

  Problems 51, 52, and 53 are interesting.

- 3.1 Derivative of Polynomials and Exponential Functions

  Starting with the definition of the derivative, this section shows simple rules for finding the derivative of polynomials and e^x.

  Problems 3-32 are basic practice. Lots of later problems in this section are interesting and good practice: 63-75, for instance.

- 3.2 The Product and Quotient Rules

  The important produce and quotient rules are introduced.

  Problems 3-30 are basic practice.