MATH1220: Midterm 1 Study Guide

The following is an overview of the material that will be covered on the first exam.

§6.1 The Natural Logarithm Function

- The definition of the natural logarithm, including its derivative.
- Computing integrals of the form $\int du/u$.
- Using properties of logarithms to simplify the computation of derivatives (this is called logarithmic differentiation).
- Computing certain trig integrals (e.g., $\int \tan x\, dx$).

§6.2 Inverse Functions and Their Derivatives

- Finding the inverse of a function.
- Show a function has an inverse (without actually finding it). Our standard method for doing this is using Theorem A from §6.2.
- Checking that two functions are inverses of each other (we just show that $f \circ f^{-1}(y) = y$ and $f^{-1} \circ f(x) = x$).
- Using the Inverse Function Theorem.

§6.3 The Natural Exponential Function

- The definition of the natural exponential function, including its derivative.
- Computing derivatives of the form $D_x(e^u)$ and integrals of the form $\int e^u\, du$.

§6.4 General Exponential and Logarithmic Functions

- Derivatives and integrals involving general exponential functions (i.e., a^x for arbitrary a) and general logarithms ($\log_a x$).
- Differentiating (or integrating) using the definition of a^x (e.g.,$D_x(x^x) = D_x(e^{x \ln x})$).

§6.5 Exponential Growth and Decay

- Solving word problems involving exponential growth/decay.
- Know that $\lim_{h\to 0}(1 + h)^{1/h} = e$.
- Solving separable differential equations by integration.

§6.6 First Order Linear Differential Equations

- Solving linear first-order differential equations using the integrating factor technique (*I guarantee you will be asked to do this on the exam*).
- Finding the general solution to such a differential equation.
- Finding a specific solution using given initial conditions.

§6.7 Approximations for Differential Equations

- Sketch a specific solution to a differential equation when given the slope field and an initial condition.
- Use Euler's Method to approximate a solution to a differential equation.