MATH1210: Midterm 1 Study Guide

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

§1.1 Introduction to Limits

- The intuitive meaning of a limit.
- Calculating limits from the graph of a function.
- Calculating limits from a table of functional values.
- One sided limits.
- Example of a limit that doesn't exist.
- Example of a one-sided limit that doesn't exist.
- $\lim_{x\to c} f(x) = L$ if and only if $\lim_{x\to c^+} f(x) = L$ and $\lim_{x\to c^-} f(x) = L$

§1.3 Limit Theorems

- Know the Main Limit Theorem. If given one side of any equality in the theorem, you should be able to fill in the other side.
- The substitution theorem (this is the one that says you can just plug in $x = c$ for polynomials and rational functions).
- Theorem C (this is the one that tells us we are justified in cancelling out like factors in numerator and denominator).
- *Know the squeeze theorem and how to use it.*

§1.4 Limits Involving Trig Functions

- Know the Trig Limit Theorem (this is the substitution theorem for trig functions).
- Know $\lim_{x\to 0} \frac{\sin x}{x} = 1$ and $\lim_{t\to 0} \frac{1-\cos t}{t} = 0$.
- You should be able to evaluate trig limits like the ones we did in class and for homework. For example $\lim_{\theta\to 0} \frac{\tan 5\theta}{\sin 2\theta}$.
- Know the pythagorean identity ($\sin^2 x + \cos^2 x = 1$).
- Know the sum and difference of angles formulas (note that the double angle formulas are special cases of these).

§1.5 Limits at Infinity/Infinite Limits

- How to calculate limits at $\pm\infty$.
- How to calculate infinite limits.
- Graphing rational functions with asymptotes.

§1.6 Continuity of Functions

- Definition of continuity at a point.
- Definition of continuity on an interval (either open or closed).
- Restatement of previous limit and substitution theorems in term of continuity.
- The composition limit theorem.
- *The Intermediate Value Theorem and how to use it.*