Final Exam
M221

The following was prepared by Joel Robbin who is writing the Final Exam.

You should be able to correctly state the following theorems and definitions on the final. You should be able to prove the ones marked with a [*].

- The five Limit laws on page 61.
- The squeeze theorem pn page 67.
- The Intermediate Value Theorem on page 86.
* All the differentiation formulas in section 2.2 [*]
- The values for $\lim_{h\to 0} \sin h$, $\lim_{h\to 0} \cos h$, $\lim_{h\to 0}(\sin h)/h$ $\lim_{h\to 0}(1 - \cos h)/h$, from 2.4.
* The formulas for the derivatives of the 6 trig functions on page 148. [*]
* The chain rule on page 151. (You may give the "flawed" proof.)[*])
- The definition of inverse functions from page 203.
- The formula for the derivative of an inverse function from page 205.
* The formulas for the derivatives of the inverse trig functions on page 233.[*]
* The proof of l'Hospital's Rule from page 242.[*]
- The Extreme Value Theorem frpm page 255.
* Fermat's theorem (a local extremum is a critical point) from page 257.[*]
* The Mean Value Theorem from page 263.[*]

* $f' = 0 \Longrightarrow f =$constant from page 265.

* The first derivative test for monotonicity from page 268 [*].

* The first derivative test for local extrema from page 269 [*].

* The second derivative test for concavity from page 274 [*].

* The second derivative test for local extrema from page 275 [*].

- The definition of the definite integral as a limit of Riemann sums from page 336.

- The properties of the integral from page 341, 343.

- The Fundamental Theorem of Calculus from page 348 and 350.

If you are asked to provide a proof, the question should indicate what you may assume without proof. Here is some possible wording.

> Prove the Mean Value Theorem. (You may assume without proof the "Extreme Value Theorem" which asserts that a contiunuous function defined on a closed interval $[a, b]$ assumes its minimum and maximum value.)

> State and prove the formula for the derivative of a quotient. (You may use without proof the limit laws for sums, differences, products, quotients, and constants.)