Midterm 2 Study Guide

- 1. The product and quotient rules for derivatives, know how to use them.
- 2. Know how the higher order derivatives are defined, and how to compute them.
- 3. Derivatives of trigonometric functions.
- 4. Chain rule, know how to use it.
- 5. Implicit differentiation: How to find $\frac{dy}{dx}$ from a relation between x and y.
- 6. Related rates problems
- 7. Linear approximation to a function using its derivative. Use it to estimate values like $\sqrt{1.01}$.
- 8. Definition of absolute maxima/minima, and local maxima/minima.
- 9. Extreme Value Theorem (Theorem 1 on 4.2)
- 10. Critical points. Fermat's theorem (Theorem 2 on 4.2)
- 11. Finding the maximum and minimum value of a continuous function on a closed interval. (Theorem 3 on 4.2)
- 12. Rolle's Theorem (Theorem 4 on 4.2)
- 13. Mean Value Theorem, statement and use
- 14. A function with derivative 0 is constant (Corollary on top of page 195)
- 15. Sign of the derivative indicates increasing/decreasing
- 16. First derivative test for critical points
- 17. Definition of concave up/concave down, how to test for the using the second derivative.
- 18. Second derivative test for critical points.

Things you need to know how to prove

- 1. Prove the rule for the derivative of $\tan x$, given the rules for $\sin x$, $\cos x$.
- 2. Prove the rule for the derivative of $\sin x$ (theorem 1 on 3.6)
- 3. Prove the Mean Value Theorem using Rolle's Theorem.