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. Fiding 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.