Exam 2 Review MATH 251.03(04), CALCULUS I, FALL 2013

- 1. Understand the definition of a derivative.
 - What does it mean for a function f to be differentiable at a point x = c?

$$f'(c) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \text{ has to exist}$$

- The derivative of f at x = c is the slope of the tangent line to y = f(x) at the point (c, f(c)).
- 2. Understand the relationship between the graph of a function f(x) and its derivative f'(x)
- 3. THE RULES
 - (a) Power Rule: $\frac{d}{dx}(x^n) = nx^{n-1}$ for any real number n.

(b) Product Rule:
$$\frac{d}{dx}(fg) = f'g + g'f$$
.

- (c) Quotient Rule: $\frac{d}{dx}(\frac{f}{g}) = \frac{gf' g'f}{g^2}$.
- (d) Derivatives of basic trigonometric functions
- (e) Limits involving trigonometric functions

i.
$$\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1$$

ii. $\lim_{\theta \to 0} \frac{\cos \theta - 1}{\theta} = 1$

(f) Chain Rule: $\frac{d}{dx}(f(g(x)) = f'(g(x)) \cdot g'(x))$.

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- (g) Implicit differentiation
- (h) Logarithmic differentiation
- 4. Applications of derivatives: understand the derivative as a rate of change
 - (a) velocity function as a derivative of the displacement function
 - (b) Acceleration function as a derivative of the velocity function.
- 5. Derivatives of Logarithmic functions.
- 6. Related Rates
- 7. Linear approximations.
- 8. Maxima and minima of functions.