Math 130-04, Fall 2010 — Second Test Info

The second test for this course will be given in class on Friday, October 22. The test will cover Section 2.6 and Sections 3.1 through 3.6. You will ***not*** *be tested on the trigonometric limits from Section 3.4 or on the economic models for average and marginal cost from Section 3.5 The format of the test will be similar to the first test.*

In addition to my usual office hours this week, I will be available in my office on Thursday from 10:00 to 11:00 AM and from 1:30 to 4:00 PM.

You will not need a calculator for the test. *A basic non-graphing calculator will be provided to you, and you will be permitted to use only the calculator that is provided. Scrap paper will also be provided. All you need is a pencil (or pen).*

Here are some terms and ideas that you should be familiar with for the test:

continuity of a function at a point $x = a$: $\lim_{x \to a} f(x) = f(a)$

continuity from the left and from the right

continuity on an interval

how a function can be discontinuous

what continuity and discontinuity look like on a graph

Intermediate Value Theorem: If f is a continuous function on a closed interval $[a, b]$ and if L is between $f(a)$ and $f(b)$, then there is at least one c in the interval $[a, b]$ that satisfies $f(c) = L$.

$f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$, provided that the limit exists

$\dfrac{f(x+h) - f(x)}{h}$ represents the slope of a secant line to the curve $y = f(x)$

$f'(a)$ is the slope of the tangent line to the curve $y = f(x)$ at the point $(a, f(a))$

finding derivatives using the limit definition

finding the equation of a tangent line

the derivative of a function $f(x)$ is itself a function (with its own graph)

relationship between the graph of a function and the graph of its derivative function

differentiable (meaning, the derivative exists)

how a function can fail to be differentiable (not continuous; corner; vertical tangent line)

Theorem: If $f(x)$ is differentiable at $x = a$, then $f(x)$ must also be continuous at $x = a$

alternative notations for the derivative of $y = f(x)$: $\dfrac{dy}{dx}$, $\dfrac{d}{dx}(f(x))$, y'

higher order derivatives: $f''(x)$, $f'''(x)$, $f^{(n)}(x)$, $\dfrac{d^2y}{dx^2}$, y'', etc.

using derivative rules to calculate derivatives

proofs of very basic derivative rules (**not** the product, quotient, or chain rule)

derivatives as rates of change

velocity, acceleration, and speed

motion problems and other problems involving rates of change

population growth models

exponential growth

modeling the world with mathematics—and calculus in particular

You should memorize and know how to use the following derivative rules:

Basic rules: $\frac{d}{dx}\, c = 0$, if c is a constant

$\frac{d}{dx}\, x = 1$

$\frac{d}{dx}\, x^n = nx^{n-1}$, if n is a constant

$\frac{d}{dx}\, \sqrt{x} = \frac{1}{2\sqrt{x}}$, (or $\frac{1}{2}x^{-1/2}$)

$\frac{d}{dx}\, e^x = e^x$

$\frac{d}{dx}\, \sin(x) = \cos(x)$

$\frac{d}{dx}\, \cos(x) = -\sin(x)$

Constant multiple rule: $\dfrac{d}{dx}\,(c \cdot f(x)) = c \cdot \dfrac{d}{dx}\,(f(x))$, if c is a constant

Sum rule: $\dfrac{d}{dx}\,(f(x) + g(x)) = \dfrac{d}{dx}\,(f(x)) + \dfrac{d}{dx}\,(g(x))$

Difference rule: $\dfrac{d}{dx}\,(f(x) - g(x)) = \dfrac{d}{dx}\,(f(x)) - \dfrac{d}{dx}\,(g(x))$

Product rule: $\dfrac{d}{dx}\,(f(x) \cdot g(x)) = f(x) \cdot \dfrac{d}{dx}\,(g(x)) \;+\; g(x) \cdot \dfrac{d}{dx}\,(f(x))$

Quotient rule: $\dfrac{d}{dx}\left(\dfrac{f(x)}{g(x)}\right) = \dfrac{g(x) \cdot \frac{d}{dx}\,(f(x)) \;-\; f(x) \cdot \frac{d}{dx}\,(g(x))}{g(x)^2}$

Chain rule: $\dfrac{d}{dx}\,(f(g(x))) = f'(g(x)) \cdot \dfrac{d}{dx}\,(g(x))$