Math 125 Exam 2 Review Sheet

Exam 2 will be on **Tuesday, 3/24**. It will cover Chapter 3.

I will have additional office hours before the exam: Monday, 3/23, 2 - 5:30 p.m. and Tuesday, 3/24, 11 a.m. - 12:30 p.m.

No books, notes, or calculators will be allowed on the test. For full credit, solutions of the exam problems must be correct and clearly written, and you must show all your work.

To prepare for the test, review the topics listed below. Make sure that you know the main concepts, facts, and methods. If you feel that you do not know a topic well, read the book or the class notes. Go over the Hw as needed and take a look at the quizzes.

Topics to review:

- Two definitions of the derivative of $f(x)$ at $x = a$.
  You should be able find the derivative using the definition.
  What does it mean for $f(x)$ to be differentiable at $x = a$?
- If $f(x)$ is differentiable at $x = a$, then it is continuous at $x = a$.
  $f(x)$ can be continuous, but not differentiable at $x = a$. Give an example.
- $f'(a)$ = the slope of the tangent line to the graph of $f(x)$ at $x = a$.
  How to write an equation of the tangent line to the graph of $f(x)$ at $x = a$?
- If the graph of $f(x)$ is given, how to sketch the graph of $f'(x)$?
- $f'(a)$ is the (instantaneous) rate of change of f at a.
  What are the units of the rate of change?
- You need to know the derivatives of the following functions:
  $c,\ x^n,\ e^x,\ b^x,\ \ln x,\ \log_b x = \frac{\ln x}{\ln b},\ \sin x,\ \cos x,\ \tan x,\ \sin^{-1} x,\ \cos^{-1} x,\ \tan^{-1} x.$
- You need to know and be able to use the the following rules for the derivative:
  constant multiple, sum/difference, product, quotient, chain, derivative of the inverse function. To practice differentiation you may solve (some of) the odd-numbered problems 29-69 on p. 208-209.
- Higher derivatives: how are they defined?
  What can you say about derivatives of polynomials?
  How to determine if f'' is positive or negative from the shape of the graph of f?
  If position of an object moving in a straight line is $s(t)$, then $v(t) = s'(t)$ is its velocity and $a(t) = v'(t) = s''(t)$ is its acceleration.
- Implicit differentiation: How to find $\frac{dy}{dx}$? How to write an equation of the tangent line at a given point?
- Applied Chain Rule problems such as 3.7 Ex. 90-93:
  Describe the setup of such a problem and steps of a solution.
- Related rates problems: Describe the steps of a solution. Make sure that you understand the examples in the book and can solve the Hw problems.