Math 1500 Fall 2010
Exam 3 Review

This is just a guide to help you study. I do not guarantee that anything will or will not be on the exam based on this guide.

1 Basics

Tuesday, November 16, 2010 in class. No books or notes or cell phones. You may use a scientific calculator and the Unit Circle Chart.

§1.6 (inverse trig functions only), §3.3-§3.10 (not differentials and you do not need to memorize inverse trig derivatives but you should know how to find them), Appendix D, area and perimeter of a rectangle, area and circumference of a circle, area of a triangle

2 Practice Problems

- pg. 73 **Concept Check** 13
- pg. 261**Concept Check** 1, 2, 4, 5
- pg. 262-264 **Exercises** 1-11, 13-37, 39-42, 44, 46, 49-54, 57-61, 63ab, 65, 66, 69-78, 83, 84, 90, 92-101, 103a
- pg. A32-A33 **Exercises** 23-28

3 Suggestions

- Work lots and lots of problems, especially those on material you don't understand as well.
- When possible, ask yourself WHY you are solving a problem a certain way or WHY the result is true.
- Do not look at solutions unless you are desperate.
- Check your work!!

4 Sample Exam

Sphere	**Cylinder**	**Cone**
$V = \frac{4}{3}\pi r^3$	$V = \pi r^2 h$	$V = \frac{1}{3}\pi r^2 h$
$A = 4\pi r^2$		$A = \pi r\sqrt{r^2 + h^2}$

1. Find $\frac{dy}{dx}$ by implicit differentiation for $4xy - \tan(y) = 3x^2 + e^y$.

2. Use logarithmic differentiation to find the derivative of

$$y = \frac{(2x-3)^2}{\sqrt{x+1}(x^2+2x)^2}.$$

3. Differentiate the following functions.
   (a) $f(x) = \cos x$
   (b) $f(x) = \ln x^2 - x$
   (c) $f(x) = \sin \sqrt{x^2 + 2x}$

4. A girl starts at a point A and runs east at a rate of 10 feet/second. One minute later, another girl starts at A and runs north at a rate of 8 feet/second. At what rate is the distance between them changing 1 minute after the second girl starts?

5. Let $C(g) = 800 + 6g - 0.1g^2 + 0.0002g^3$ be the cost of producing g gallons of ice cream.
   (a) Find the marginal cost function.
   (b) Explain the meaning of the statement $C(150) = 125$.
   (c) Since $C'(150) = -10.5$ should the company increase or decrease the number of gallons they produce if they want to cut costs?

6. (a) Find the linear approximation to $f(x) = \frac{1}{x}$ at $a = 1$.
   (b) Use that to estimate the value of $\frac{1}{0.9}$ and $\frac{1}{1.2}$.

7. The number of bacteria in a certain culture increases from 5000 to $15,000$ in 10 hours. Assume that the rate of increase is proportional to the number of bacteria present.
   (a) Find a formula for the number of bacteria in the culture at any time t.
   (b) Estimate the number at the end of 20 hours.
   (c) When will the population be $50,000$?

8. (a) Explain why linear equations do not satisfy the differential equation
$$\frac{dy}{dx} = k \cdot y.$$
   (b) Explain why exponential functions $y = Ce^{kx}$ satisfy the differential equation
$$\frac{dy}{dx} = k \cdot y$$