Math 180

FIRST HOUR EXAM

NAME____

General Notes:

1. Show work.
2. Look over the test first, and then begin.
3. Calculators are not permitted on this exam. Carry out any calculations to the point at which you would need a calculator (for example, to take the square root of the logarithm of a number) and leave it in that form.

Friday, February 12, 2010
100 pts.

I. Functions

1. Some definitions (5 pts. each)

   a. What is a function?

   b. What is the inverse of a function (if it exists)?

   c. What does it mean to say that a function is odd? As **part** of your answer, give an example.

2. (5 pts.) Find the inverse to the function f(x) = 3x+9. Please write your answer as a function of x..

3. (5 pts.) What standard function is the inverse of the function $f(x) = \ln(x)$? (remember that $\ln(x) = \log_e(x)$)

4. (10 pts.) Let $f(x) = x^2 - 1$ and $g(x) = x^2 + 1$. What is $(f \circ g)(x)$ in this case? Simplify your answer.

II. Logarithmic and trigonometric functions

1. Simplify the following expressions to a number (5 pts. each - remember - no calculators)

   a. $\log_2 8^{12}$

   b. $e^{\ln(42)}$

2. Solve for x (5 pts)

   $2(3^{3x}) = 54$

3. (10 pts) Suppose that $\sin(\theta) = \frac{1}{2}$ and that $\frac{\pi}{2} < \theta < \pi$. What are the values of $\cos(\theta)$ and $\tan(\theta)$ in this case (your answer may involve expressions involving square roots (remember - no calculators)).

III. Limits and the like

1. (5 pts.) Give an informal definition of $\lim_{x \to a} f(x) = L$ as you would explain it to an intelligent friend who has not yet taken Math 180. Please incorporate distance in your explanation (remembering that this is only a five point question).

2, (5 pts. each) Find the following limits:

a. $\lim_{x \to 1} \frac{x^2 - 4}{x - 2}$

b. $\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$

c. $\lim_{h \to 0} \frac{\sqrt{3h + 9} - 3}{h}$

3. (20 pts.) Find the equation of the line tangent to the curve $f(x) = x^2 - 2$ at the point $(1,-1)$. Do this in two parts (10 pts. for each part)

First, find $\lim_{h \to 0} \frac{f(1+h) - f(1)}{h}$. This will give you the slope of the tangent line at the given point.

Next, use the slope from the first part and the information that (1, -1) is on the graph (since f(1) = -1), to find the equation of the tangent line through (1, -1).