MATH 1A - MOCK MIDTERM 1

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Name: _____

Instructions: This is a mock midterm, designed to give you an idea of what the actual midterm will look like. Make sure you do it, the actual exam will be very similar to this one (in length and in difficulty)!

1		10
2		10
3		10
4		15
5		40
6		15
Bonus 1		5
Bonus 2		5
Total		100

Date: Friday, July 1st, 2011.

1. *(10 points)* Find the domain of $f(x) = \ln(x) + \sqrt{x^2 - 1}$

2. *(10 points, 5 points each)* In the following problem, you do **not** have to graph the resulting functions. **BE BRIEF!**

   (a) Explain in words how to obtain the graph of $y = 2x^3 - 1$ from the graph of $y = x^3$

   (b) Explain in words how to obtain the graph of $y = \sin(-2x + 3)$ from the graph of $y = \sin(x)$

3. *(10 points)* Find $f^{-1}(x)$, where $f(x) = \ln(2x + 3)$

Note: Make sure to write your final answer in terms of x.

4. *(15 points)* Evaluate $\sin(\tan^{-1}(x))$

Note: Show your steps. You are not only graded on the correct answer, but also on the way you write up your answer.

5. *(40 points, 5 points each)* Evaluate the following limits (or say 'it does not exist'). **Briefly show your work!** :

   (a) $\lim_{x\to 1} \frac{\sqrt{x+3}-2}{x-1}$

   (b) $\lim_{x\to 4} \frac{x^2-4x}{x^2-3x-4}$

   (c) $\lim_{x\to \infty} \frac{\sqrt{x^2+1}}{x}$

   (d) $\lim_{x\to 0} \frac{1}{x} - \frac{1}{|x|}$

(e) $\lim_{x\to 0} x^4 \cos\left(\frac{2}{x}\right)$

(f) $\lim_{x\to\infty} \frac{x^3-x^2}{x^2-1}$

(g) $\lim_{x\to 3^+} \ln(x^2-9)$

(h) $\lim_{x\to\infty} \tan^{-1}(x^2-x^4)$
(you may use the fact that $\tan^{-1}(-\infty) = -\frac{\pi}{2}$, but justify the fact that you can put the limit inside the $\tan^{-1}$)

6. *(15 points)* Show that the equation $\cos(x) = x$ has at least one solution.
Show your work: You will be graded not only on the correct answer, but also on the way you write up your answer

Bonus 1 *(5 points)* Which function is both even and odd? Prove that your answer is correct!

Bonus 2 *(5 points)* Given a one-to-one function f, find the inverse of the function $g(x) = f(cx + d)$ (where c, d are nonzero real numbers).

Hint: Think of this in terms of actions. In order to obtain $g(x)$ from x, what do you do first? What do you do second? What do you do last? Now think about how you can 'undo' g.