Midterm Exam 1
Math 1
October 9th, 2013

Name: _____

Please circle your instructor's name below

Infeld Petit

Please read the following instructions before starting the exam:

- This exam is closed book, with no calculators, notes, or book allowed. You may not give or receive any help during the exam, though you may ask the instructors for clarification if necessary.
- Be sure to show all work whenever possible. Even if your final answer is incorrect, we can assign an appropriate amount of partial credit if we can see how you arrived at your answer.
- Please circle or otherwise indicate your final answer, if possible.
- The test has a total of x questions, worth a total of 100 points. Point values are indicated for each question.
- You will have two hours from the start of the exam to complete it.
- Good luck!

HONOR STATEMENT: I have neither given nor received help on this exam, and I attest that all the answers are my own work.

SIGNATURE:_____

This page is for grading purposes only

Problem	Points
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

This page is for reference only

Angle	Radians	$\sin(\theta)$	$\cos(\theta)$	$\tan(\theta)$
$0°$	0	0	1	0
$30°$	$\pi/6$	$1/2$	$\sqrt{3}/2$	$1/\sqrt{3}$
$45°$	$\pi/4$	$1/\sqrt{2}$	$1/\sqrt{2}$	1
$60°$	$\pi/3$	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$
$90°$	$\pi/2$	1	0	DNE

1. **Multiple choice.** Circle the correct answer to each question. [5 points each, no partial credit].

   If $f(x) = (x\sin(x))^2$ and we tried to find $\lim_{x\to 0} f(x)$, the function that could be useful as a lower bound (i.e. a function $g(x)$ such that $g(x) \leq f(x)$ for all x) in the squeeze theorem is:

   - x
   - $x\sin(x)$
   - 0
   - $2x\sin(x)$

   $\log_a(x)$ is:

   - $\ln(x^a)$
   - $\log_b(x^a)$
   - $\frac{\ln(x)}{\ln(a)}$
   - $\frac{\ln(a)}{\ln(x)}$

2. Find the domain of $\sin[\ln(x-4)]$. [10 points]

3. Simplify the following expressions: [5 points each]

- $\frac{a^7 b^9 c^3}{a^2 b^4 d^{-1}}$

- $\log_2 \left(\frac{4^{-x+2}}{8^{2x}} \right)$

4. Compute the following limits: [5 points each]

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

- $\lim_{x \to 3} \frac{x + 2}{-x^2 + 8x - 3}$

5. Find the following values: [5 points each]

   - $\log_{1/7}(49)$

   - $\tan^{-1}(-1)$

6. Consider the following function: $f(x) = \ln(3x - 2) - 1$ [10 points overall]

   - Find the domain and range of $f(x)$. [5 points]

   - Find the expression for $f^{-1}(x)$. [5 points]

7. Suppose that you're given the functions

$$f(x) = \frac{1}{\sqrt{1-x^2}},\ g(x) = \cos(2x+4).$$

- Find the expression for $(f \circ g)(x)$. [5 points]

- Find the expression for $(g \circ f)(x)$. [5 points]

8. • Draw the unit circle and the angles $-\frac{7\pi}{6}$ and $\frac{5\pi}{3}$ on it. [2 points]

• Find the values of $\sin(\theta)$, $\cos(\theta)$, $\tan(\theta)$ and $\csc(\theta)$ for the two angles you just drew. [2 points each].

9. Consider the function $f(x)$ whose graph is the following:

Find the following limits. If a limit is infinite specify whether it's $+\infty$ or $-\infty$ [2 points each]

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

10. Suppose the displacement function of an object is given by $f(x) = \frac{x^2}{5}$. [10 points overall]

- Find the average rate of change over the interval $[2, 4]$. [4 points]

- Find the average rate of change over the interval $[2, 3]$ [4 points]

- Assume that the following table gives you the average rate of change values as the second point $2 + h$ gets closer to $x = 2$. Use it to estimate the slope of the tangent line to $f(x)$ at $x = 2$. [2 point]

h	v_{av}
.5	1.25
.2	0.968
.1	0.882
.05	0.8405
.02	0.8160
.01	0.8080
.001	0.80008
.0001	0.800008