

NAME: \_\_\_\_\_

SECTION: \_\_\_\_\_

# MATH 1 MIDTERM 1

October 13, 2010

INSTRUCTIONS: This is a closed book, closed notes, calculator-free, computer-free exam. You are not to give nor to receive help from any outside source during the exam. Remember that your instructors can clarify any questions that are not clear to you.

Please show all of your work and justify all of your answers.

## HONOR STATEMENT:

I have neither given nor received help on this exam, and all of the answers are my own work.

\_\_\_\_\_  
Signature

Question	Points	Score
1	9	
2	6	
3	6	
4	10	
5	10	
6	14	
7	14	
8	10	
9	12	
10	8	
11	1	
Total:	100	



3. You are given the graph of a function  $f(x)$ . Please explain in words the steps you would take to produce the graph of the below functions from the function  $f(x)$ .

(a) [3 points]  $g(x) = f(2x - 1) - 6$

(b) [3 points]  $h(x) = \frac{1}{4}f(-x) + 2$

4. Simplify the below expressions as far as you can. Please show all of your work.

(a) [5 points]  $\ln(y \ln(e^x)) - (\ln(y) + \ln(x))$

(b) [5 points]  $\log_2(x^2 - 1) + y \log_2(3) - \log_2(x - 1)$

5. [10 points] Zsuanna Folt was given data about the growth of the famous Dartmouth Zoombat population that she thinks the data has an exponential shape  $f(x) = Ca^x + b$ . She sees important data points at  $(0, 2)$ ,  $(1, 5)$ , and  $(2, 11)$ . Help her find the constants  $C$ ,  $a$ , and  $b$  and help her state  $f(x)$ . Please show all of your work.

For questions 6 and 7, use algebra to (a) show that the following functions are even, odd, or neither. Also (b) state the domain and the range of each function, (c) note if the function is 1-to-1, and (d) please draw a graph of the function. Please justify all of your answers.

6. Consider  $f(x) = 2 \cos x$ .

(a) [4 points] Symmetry:

(b) [2 points] Domain:

(c) [2 points] Range:

(d) [2 points] 1-to-1:

(e) [4 points] Graph:

7. Consider

$$k(x) = \begin{cases} 2 & : x \leq -1 \\ x^2 & : -1 < x < 1 \\ 2 & : 1 \leq x \end{cases}$$

(a) [4 points] Symmetry:

(b) [2 points] Domain:

(c) [2 points] Range:

(d) [2 points] 1-to-1:

(e) [4 points] Graph:

8. The height of a ball tossed from the ground as a function of time can be modeled by the quadratic polynomial  $f(x) = -x^2 + 11x - 10$ . Please justify your answers.

(a) [5 points] Sketch the graph, noting the y-intercept and zeros.

(b) [2 points] When does the ball hit the ground?

(c) [3 points] From the symmetry of the graph, can you tell exactly when the ball is at the highest point?



9. Find an expression for the inverse function of the following functions.  
Please show all of your work.

(a) [4 points]  $f(x) = 4x - 13$

(b) [4 points]  $g(x) = \ln(3x + 2)$

(c) [4 points]  $h(x) = 4 + 3^{(x-1)}$

10. [8 points] For any  $f(x)$ , then the function  $g(x) = \frac{(f(x) - f(-x))}{2}$  is:

1. always even
2. always odd

Please choose one and justify your answer.

11. [1 point] Write a name for a new math superhero or a new math villain.