

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

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

# MATH 1 PRACTICE MIDTERM 1

October 09, 2009

INSTRUCTIONS: This is a closed book, closed notes exam. You are not to provide or receive help from any outside source during the exam.

- You may not use a calculator.
- Show all of your work.

HONOR STATEMENT:

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

\_\_\_\_\_  
Signature

Question	Points	Score
1	18	
2	8	
3	9	
4	18	
5	7	
6	10	
7	7	
8	8	
9	6	
10	9	
Total:	100	

1. Consider the function  $f(x) = x - x^2$ .

(a) [2 points] Compute the value  $f(3)$ .

(b) [2 points] Compute the value  $f(4)$ .

(c) [4 points] In terms of  $x$ 's and  $h$ 's, what are  $f(x)$  and  $f(x + h)$ ?

- (d) [6 points] Find the slope of the line passing through the points  $(x, f(x))$  and  $(x + h, f(x + h))$  on the graph of  $f$ . (You may assume  $h \neq 0$ .)

- (e) [4 points] Find the equation of the line passing through the points  $(3, f(3))$  and  $(4, f(4))$  on the graph of  $f$ .

2. Consider the function  $g(x) = \frac{x^3+x^2}{x^2}$ .

(a) [4 points] What are the domain and range of  $g(x)$ ?

(b) [4 points] Simplify  $\frac{g(1+h)-g(1)}{h}$  (there is an easy way and a hard way to do this). (You may assume that  $h \neq 0$  and  $(1+h) \neq 0$ .)

3. Consider the function  $g(x) = \frac{1}{x-1}$ .  
(Hint: Think about the graph of  $h(x) = \frac{1}{x}$ )

(a) [2 points] What is the domain and range of  $g(x)$ ?

(b) [4 points] Find the inverse function,  $g^{-1}(x)$  of  $g(x)$ . Find the domain and range of  $g^{-1}(x)$ .

(c) [3 points] Consider the function  $f(x) = 2x + 1$ . Simplify  $(f \circ g)(x)$ .

4. Simplify the following expressions.

(a) [4 points]  $\frac{4}{x} + \frac{x}{x+1}$  (assume that  $x \neq -1$ )

(b) [3 points]  $\left(\frac{x^2y}{y^2x}\right)^{-2}$

(c) [3 points]  $\log_4(16^3)$

(d) [4 points] Write the following expression as one (natural) logarithm:  
 $\ln(x + y) + \ln(x - y) - 2 \ln(z)$

(e) [4 points]  $\log_3(18) + \log_3(6) - \log_3(4)$

5. In each of the following equations solve for  $x$ .

(a) [3 points]  $e^{10x+1} = 3$

(b) [4 points]  $\ln((x - 1)^2) = 2$

6. We will now examine in detail the function  $g(x) = -(x - 2)^3 + 3$ .

(a) [2 points] Sketch the basic function  $y = x^3$ .

(b) [2 points] Sketch the graph of  $y = (x - 2)^3$ .



(c) [2 points] Sketch the graph of  $y = -(x - 2)^3$ .

(d) [2 points] Sketch the graph of  $y = -(x - 2)^3 + 3$ .

(e) [2 points] What is the domain of  $g(x) = -(x - 2)^3 + 3$ ? What is the range?

7. Consider the following function

$$g(x) = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$$

(a) [2 points] Sketch a graph of  $g(x)$ .

(b) [2 points] In words, what does the function  $g(x)$  do?

(c) [3 points] Is the function  $g(x)$  one-to-one? Explain why or why not (if you use a test, explain how/why it works - otherwise, referring to the definition is always safe).

8. (a) [2 points] Find a function of the form  $f(x) = Ca^x$  that goes through points  $(0, 5)$  and  $(2, 20)$ . In other words find the constants  $C$  and  $a$  that would have the function  $d$  go through these points.

(b) [4 points] Find the inverse of the function  $f(x)$ .

- (c) [2 points] Assuming your inverse function in part (b) is correct, what do you expect  $(f^{-1} \circ f)(x)$  will be? (*Hint: If you can't remember, try computing it and see what you get.*)

9. Are the following functions even, odd or neither? Please justify your answer with a graph or an equation.

(a) [2 points]  $f(x) = x^3 + x$

(b) [2 points]  $f(x) = x^2$

(c) [2 points]  $f(x) = x^3 + 1$

10. (a) [3 points] Sketch a graph of  $f(x) = \sin(x)$ . What is the domain of  $f(x)$ ? What is the range?

(b) [3 points] Sketch a graph of  $g(x) = \sin(2x)$ . What is the domain of  $g(x)$ ? What is the range?

(c) [3 points] Sketch a graph of  $h(x) = \frac{1}{2} \sin(x)$ . What is the domain of  $h(x)$ ? What is the range?