

MATH 241, Fall 2008

Exam 1: October 3

NAME \_\_\_\_\_

Discussion section \_\_\_\_\_

1	2	3	4	5	6	7	8	Total

Arrange your work as clearly and neatly as possible, and cross out incorrect work. **Unless otherwise noted, you must justify all answers to receive full credit.** You may not use calculators, notes, or any other kinds of aids.

1. (10 points) If  $f(x) = 2e^{-x}$ , find a formula for  $f^{-1}(x)$ .

2. (5 points each) State the domain and range of each function.

(a)  $f(x) = \tan^{-1}(\sqrt{x})$

(b)  $g(x) = \ln(2^x - 1)$

3. (6 points each) Simplify each expression into a simple number.

(a)  $\log_2(6) - \log_2(15) + \log_2(10)$

(b)  $\cos^{-1} \left[ \cos \left( -\frac{\pi}{3} \right) \right]$

4. (12 points) Find  $\lim_{t \rightarrow 2} \frac{t^2 - 2t}{|2 - t|}$ , or show it does not exist.

5. (6 points each) Find all points where the given function is discontinuous. If the function is continuous everywhere, write NONE. (Remember to justify your answers.)

(a)  $f(x) = \frac{\sin(x)}{x}$

(b)  $g(x) = \begin{cases} 1, & \text{if } x < 0, \\ \cos(x), & \text{if } 0 \leq x < \pi, \\ \sin(x), & \text{if } x \geq \pi. \end{cases}$

6. (15 points) Find all of the vertical and horizontal asymptotes to the graph of  $y = \frac{x^3 - 3}{2x(x^2 - 1)}$ .  
It is not necessary to draw the graph.

7. (15 points) Using one of our limit formulas for the derivative, find the line tangent to  $y = 3 + 4x^2$  at the point  $(-1, 7)$ .

8. (14 points) A falling particle has height described by the equation  $s = 1/t$ . Find its velocity when  $t = 3$ .