

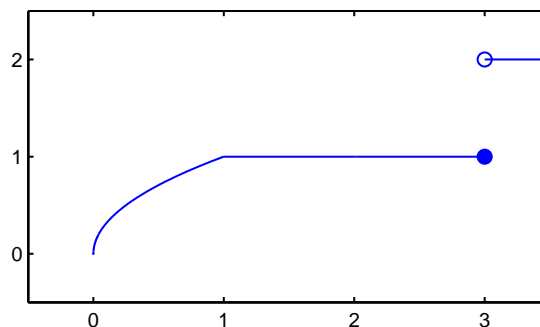
**MATH 241, Fall 2008**  
**Exam 2: November 3**

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. (12 points) At which value(s) of  $x$  is this function not differentiable? Give short reasons for each value you state.



2. (12 points) Find  $y'$  if  $y = \frac{2^x}{1-x^2}$ .

3. (12 points) Find  $y''$  if  $y = x^5 + \frac{2}{e^{2x}}$ .

4. (12 points) Find the line tangent to the hyperbola  $x^2 + 2xy - y^2 + x = 2$  at the point  $(1, 2)$ .

5. (12 points) Find  $\frac{d}{dx}[(\cos x)^x]$ .

6. (12 points) At what point does the curve  $y = [\ln(x + 3)]^2$  have a horizontal tangent?

7. (14 points) A cup of tea sits in a room kept at  $20^{\circ}\text{C}$  and cools from  $80^{\circ}\text{C}$  to  $60^{\circ}\text{C}$  in half an hour. What will be the temperature of the tea after another half hour? Simplify your answer for full credit.

8. (14 points) Gravel is dumped onto a conical pile at a rate of  $36 \text{ ft}^3$  per second. The gravel always shifts so that the base diameter of the pile equals its height. At what rate is the height of the pile increasing when it is 6 ft high? (The volume of a cone with base radius  $r$  and height  $h$  is  $\frac{1}{3}\pi r^2 h$ .)