

Math 124 C,D (Hoffman)
October 22, 2002
Midterm #1 (70 points)

Name _____

TA: _____

Section: _____

Instructions:

- Your exam contains 5 problems plus one extra credit problem. The entire exam is worth 70 points. The point value of each problem is clearly marked.
- Your exam should contain 7 pages; please make sure you have a complete exam.
- Box in your final answer when appropriate.
- When appropriate, carry out calculations to at least four decimal places.
- You have 80 minutes for this midterm. Unless stated otherwise, you **MUST** show work for credit. No credit for answers only. If in doubt, ask for clarification.
- Make sure to do your own work on the exam.

Problem #1 (20 pts) _____

Problem #2 (15 pts) _____

Problem #3 (15 pts) _____

Problem #4 (15 pts) _____

Problem #5 (5 pts) _____

Bonus Problem _____

TOTAL (70 pts) _____

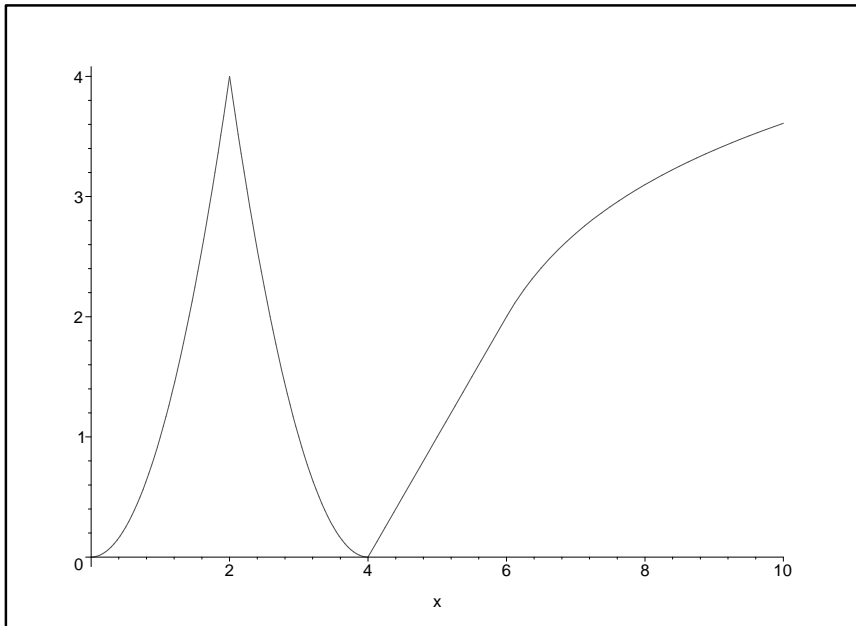
1. (20 pts) Find the derivatives of the following functions

(a) (5 pts) $h(x) = 7(x^2 + 3x)$

(b) (10 pts) $g(x) = \frac{xe^x}{x^2-3} - \cos(4x)$

(c) (5 pts) $h(x) = \ln(\cos(2x + 3))$

2. The graph of $y = f(x)$ is given below.



(a) (3 pts) Estimate $f'(1)$.

(b) (3 pts) Which values of x , if any, is $f'(x)$ not defined.

For each of the following pair determine whether the first number is greater than, less than, or equal to the second number. You do not need to show any work, just circle the appropriate symbol.

(c) (3 pts) $f''(5)$ $>$ $=$ $<$ 0

(d) (3 pts) $f(8.01)$ $>$ $=$ $<$ $f(8) + (.01)f'(8)$

(e) (3 pts) $f'(5)$ $>$ $=$ $<$ $f'(8)$

3. (15 pts) A search light in a prison rotates counterclockwise at a rate of 3 revolutions per second. The light shines on a long straight wall that is 40 feet from the search light. How fast is the light beam moving across the wall when the beam is hitting the wall at a spot which is 80 feet from the light?

4. A function $y = f(x)$ is defined implicitly by the equation

$$x^2y - y^3 + \sin(2\pi(x + y)) = 0.$$

(a) (10 pts) Find $\frac{dy}{dx}$ at the point $(2, 2)$.

(b) (5 pts) Estimate what y is when $x = 1.9973$.

5. (5 pts) Evaluate

$$\lim_{x \rightarrow 2} \frac{(7x + 3)^{1/3} - (17)^{1/3}}{x - 2}.$$

Plugging answers into your calculator is not justification for your answer.

6. (Bonus) Find a function $y = f(x)$ such that

$$y'' - 2y' + 3y = 24e^{3t}.$$

(Hint: Think about the homework problem where you solved the differential equation $y'' + y' - 2y = \sin(x)$.)