

MATH 1311 SPRING 2008

CALCULUS I

FIRST MIDTERM EXAM

TUESDAY, FEBRUARY 19, 7:00 PM - 9:00 PM

YOUR NAME (PLEASE PRINT):

Instructions: This is a closed book, closed notes exam. **Use of calculators is not permitted.** You must justify all of your answers to receive credit. Notation is important, and points will be deducted for incorrect use. Please do all of your work on the paper provided.

The Honor Code requires that you neither give nor receive any aid on this exam.

If you are bound by the Academic Honor Code, please indicate that you have read and understood these guidelines by signing your name in the space provided:

Pledged: _____

Do not write below this line

Problem	1	2	3	4	5	6	7	8	9
Points	16	10	10	12	10	10	10	12	10
Score									

Total: _____

1. Evaluate the following limits, if they exist. If a limit does not exist, determine whether or not it is infinite.

(a) $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x}$

(b) $\lim_{x \rightarrow 2^+} \frac{x^2 - x - 6}{x^2 - 4}$

(c) $\lim_{z \rightarrow 3} \frac{z^2 - 9}{z^2 - 4z + 3}$

(d) $\lim_{t \rightarrow 6} \frac{\sqrt{t+3} - 3}{t - 6}$

2. Let

$$g(x) = \frac{x^2 + 6x + 9}{x^2 - 2x - 15}.$$

(a) Find all values of x for which $g(x)$ is discontinuous.

(b) Which of the discontinuities from part (a) are removable?

3. Let

$$q(x) = \begin{cases} \frac{x^2 - 4}{|x - 2|} & \text{if } x \neq 2, \\ 0 & \text{if } x = 2. \end{cases}$$

Determine whether or not $q(x)$ is continuous at $x = 2$.

4. Find $\frac{dy}{dx}$.

(a) $y = \frac{x^2 - 4}{x^2 + 4}$

(b) $y = (2x^2 - 3x + 5)(4x^3 - 6x^2 + 1)$

(c) $y = (x^5 + 3x + 7)^{50}$

(d) $y = \sqrt{(x - 1)(x + 3)}$

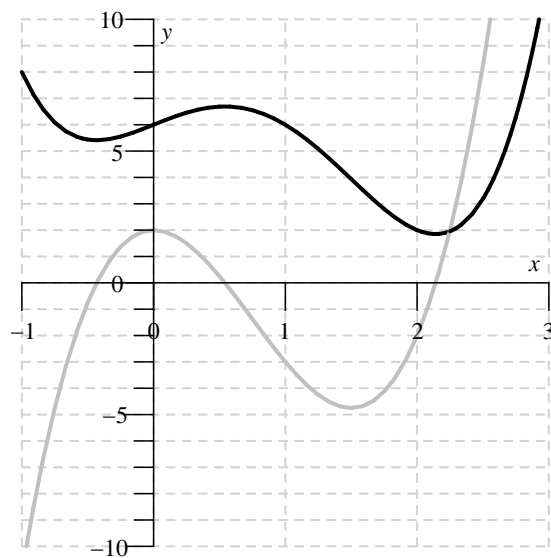
5.

(a) Given a function $f(x)$, write down the limit definition of $f'(x)$.

(b) If $f(x) = 3x^2 - 2$, use the definition of the derivative to compute $f'(x)$.

- 6.** Find the absolute maximum and minimum values attained by the function $g(x) = \frac{x}{x^2 + 1}$ on the interval $[0, 2]$.

7. The graph of a function $f(x)$ and its derivative are shown below.



(a) Determine which curve is the graph of $y = f(x)$ and which is the graph of $y = f'(x)$.1

(b) Find an equation for the tangent line to the graph $y = f(x)$ at the point $(1, 6)$.

(c) Let $h(x) = [f(x)]^2$. Compute $h'(2)$.

8. A cubical block of ice is melting in such a way that each edge decreases steadily by 2 inches every hour. At what rate is its volume changing when each edge is 10 inches long? Be sure to define every variable you introduce and give appropriate units!

9. Find all values of b so that $y = 25x + b$ is tangent to the graph of $y = x^3 - 3x^2 + x + 4$.

