

MATH 1311 FALL 2007

CALCULUS I

FIRST MIDTERM EXAM

THURSDAY, SEPTEMBER 27, 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	20	5	5	10	10	15	10	15	10
Score									

Total: _____

1. [20 points] Evaluate the following limits, if they exist.

(a) $\lim_{w \rightarrow 2^-} \frac{w^2 + w - 6}{w^2 - w - 2}$

(b) $\lim_{x \rightarrow 3} \frac{x + 4}{x^2 + x - 12}$

(c) $\lim_{z \rightarrow 1} \frac{z^2 + z + 1}{\sqrt{z + 1} - 2}$

(d) $\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta^2}$

2. [5 points] Use the Intermediate Value Property to show that the polynomial $x^3 + 3x - 3$ has a root in the interval $[0, 1]$.

3. [5 points] Let

$$h(x) = \begin{cases} x + c & \text{if } x < 0, \\ 4 - x^2 & \text{if } x \geq 0. \end{cases}$$

Find a value of the constant c so that $h(x)$ is continuous for all x .

4. [10 points]

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

(b) If $f(x) = 2x^2 - 1$, *use the definition of the derivative* to compute $f'(x)$.

5. [10 points] A table of values for f , g , f' and g' is given.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	2	4	6
2	1	8	5	7
3	7	2	7	9

- (a) If $h(x) = f(g(x))$, find $h'(3)$.

- (b) If $H(x) = f(x)g(x)$, find $H'(2)$.

6. [15 points] Find dy/dx .

(a) $y = x\sqrt{1-x^2}$

(b) $y = (x^3 + 3x - 3)^4$

(c) $y = \frac{\cos 3x}{\sin 5x}$

(d) $y = (\ln(1 + x^2))^3$

7. [10 points] Find the absolute maximum and minimum values attained by the function $g(x) = 2x^3 + 3x^2 - 12x + 2$ on the interval $[-3, 0]$.

8. [15 points] A model rocket is launched vertically upward from a point 100 m from an observer on the ground. What is the rocket's speed when the angle between the ground and the observer's line of sight is 45° and is increasing at 1° per second? Be sure to define any variables you introduce and specify units where appropriate!

9. [10 points] Find an equation of the line tangent to the curve $x^2 - xy + y^2 = 19$ at the point $(3, -2)$. Write your answer in the form $ax + by = c$.

