

NAME: \_\_\_\_\_

MATH 200 Calculus 1 (Bueler)

27 February, 2008

## Midterm Exam # 1

*100 points total. You have 60 minutes.*

1. (a) (5 pts) Compute  $f \circ g$  if  $f(x) = \sqrt{x+2}$  and  $g(x) = x^3$ .

(b) (5 pts) What is the domain of  $f \circ g$  in part (a)?

2. (10 pts) Compute the limit

$$\lim_{x \rightarrow +\infty} \frac{x^2 + x - 6}{2 - 4x^2}$$

3. (10 pts) Define this statement

$$\text{“ } \lim_{x \rightarrow a} f(x) = L. \text{ ”}$$

Give either the complete sentence definition or the “ $\epsilon/\delta$ ” definition.

4. (5 pts) Which of these is the definition of the derivative (*circle one*):

(a)

$$f'(x) = \lim_{h \rightarrow \infty} \frac{f(x) - f(h)}{h}$$

(b)

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

(c)

$$f'(x) = \lim_{h \rightarrow \infty} f(x+h) - f(x-h)$$

(d)

$$f'(a) = \lim_{x \rightarrow a} \frac{f(a) - f(x)}{x - a}$$

5. (10 pts) Compute the limit

$$\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$$

6. (a) (10 pts) On the axes provided, sketch the graph of this function.

$$g(x) = \begin{cases} \sin(x), & x \leq 0, \\ \frac{1}{x-2}, & x > 0. \end{cases}$$

- (b) (5 pts) Give the points of discontinuity of the function in part (a).

7. (10 pts) On the axes provided, sketch a graph of a function with these properties:

$$f(0) = 2, \quad \lim_{x \rightarrow 0} f(x) = 1, \quad \lim_{x \rightarrow 1^-} f(x) = 0, \quad \lim_{x \rightarrow 1^+} f(x) = 2.$$

8. (10 pts) Use the definition of the derivative to find  $f'(3)$  if  $f(x) = 3x - 1$ .

9. Suppose you are given the following data in the table:

t (hours)	0.0	1.2	2.5	3.0	4.2
s (miles hiked)	0.0	3.2	5.0	6.8	7.2

- (a) (5 pts) What is the average velocity of the hiker in the interval between  $t = 1.2$  and  $t = 3.0$ ?

- (b) (5 pts) Suppose a polynomial  $p(t)$  fits the data well and that for this polynomial  $p'(3) = 1.7$ . What is the instantaneous velocity at  $t = 3.0$  if we assume the polynomial  $p(t)$  describes the hiker's position at time  $t$ ?

10. (10 pts) On the axes provided, sketch a graph of a function for which

$$f(0) = 0, \quad f'(0) = 1, \quad f'(1) = 0, \quad f'(2) = 1.$$