

Math 124 A, B - Spring 2005
Mid-Term Exam Number One
April 19, 2005

Name: _____

Section: _____

1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
Total	70	

- Complete all questions.
- You may use a calculator during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.
- You may use one double-sided, hand-written, 8.5 by 11 inch page of notes.
- Show all work for full credit.
- You have 80 minutes to complete the exam.

1. Evaluate each of the following limits.

(a) $\lim_{x \rightarrow 4^+} \frac{x - 4}{2x - 8}$

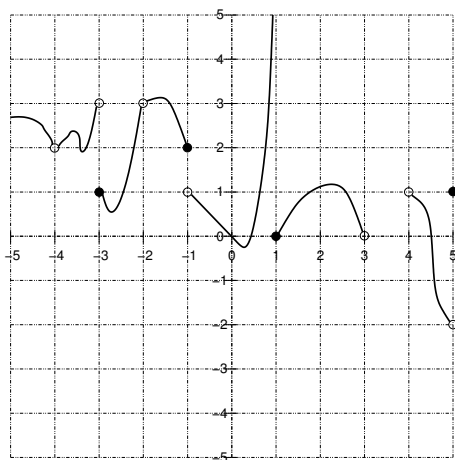
(b) $\lim_{x \rightarrow 2} \frac{1}{x^2 - 4}$

(c) $\lim_{x \rightarrow -3} \frac{x}{x + 3}$

(d) $\lim_{x \rightarrow 0^+} \frac{|x| - x}{x^2}$

(e) $\lim_{x \rightarrow 0^-} \frac{|x| - x}{x^2}$

2. The graph of $f(x)$ for $-5 \leq x \leq 5$ is shown below.



(a) Is $f(x)$ continuous at $x = -4$?

(b) What is $\lim_{x \rightarrow -4} f(x)$?

(c) What is $\lim_{x \rightarrow -3^+} f(x)$?

(d) What is $\lim_{x \rightarrow -3^-} f(x)$?

(e) What is $\lim_{x \rightarrow 1} f(x)$?

3. Find the two points on the unit circle that have tangent lines which pass through the point $(2, 3)$.

4. For a certain function $f(x)$ and $h \neq 0$,

$$\frac{f(x+h) - f(x)}{h} = \frac{-x^2 + (-h-2)x - h}{x^4 + 2hx^3 + h^2x^2}.$$

(a) Find the slope of the secant line through $(2, f(2))$ and $(5, f(5))$

(b) Find the slope of the tangent line to $y = f(x)$ at the point $(2, f(2))$.

5. A stone is thrown upward. Its height (in meters) t seconds later is given by

$$A(t) = 5 + 10t - 4.9t^2.$$

(a) Suppose $h \neq 0$. Express the average velocity of the stone from time t to time $t + h$. Simplify your expression as much as possible.

(b) Evaluate the limit of your expression in part (a) as h approaches zero.

(c) What is the instantaneous velocity of the stone at time $t = 2$?

6. Suppose j is a non-zero number. Consider the following function.

$$f(x) = \begin{cases} 3jx - \frac{2}{x} & \text{if } x \geq 1, \\ 2jx + \frac{1}{j} & \text{if } x < 1. \end{cases}$$

Find all values of j that make f continuous at $x = 1$.

7. Suppose an object is moving in the plane so that its coordinates at time $t > 0$ are given by the functions

$$x(t) = 3t - 1, y(t) = -t^2 + 3t.$$

- (a) Express the y -coordinate of the object as a function of x .

- (b) What is the largest y value attained by the object?