Math 19 E **Name:** _____
Spring 2019
Exam 1
February 15

This exam contains 5 pages and 6 questions. Total of points is 100. For full credit you must show your work. Partial credit may be given for incorrect solutions if sufficient work is shown. Messy/unorganized answers may be penalized, even if correct.

Grade Table (for teacher use only)

Question	Points	Score
1	18	
2	28	
3	12	
4	24	
5	12	
6	6	
Total:	100	

HONORS PLEDGE (sign after exam is completed): I have neither given nor received aid on this exam, nor have I observed a violation of the UVM Code of Academic Integrity.

Signature: _____

1. (18 points) Determine the following limits

   (a) (6 points)

$$\lim_{x \to 8^-} \frac{x+3}{x-8}$$

   (b) (6 points)

$$\lim_{x \to 4^+} \frac{x^2-16}{x-4}$$

   (c) (6 points)

$$\lim_{x \to \infty} \frac{x+9}{x^2+3x+2}$$

2. (28 points) For the function

$$f(x) = \frac{x^2 - 9}{x^2 + 1}$$

(a) (8 points) Find any vertical asymptotes of f.

(b) (8 points) Find any horizontal asymptotes of f.

(c) (6 points) Find the partition numbers of f.

(d) (6 points) Determine the sign chart for f.

3. (12 points) Consider the function

$$f(x) = x^2 + 7.$$

Use the limit definition of the derivative to compute $f'(x)$. No credit will be given for using shortcuts on this problem.

(a) (3 points)

$$f(x+h) =$$

(b) (3 points)

$$f(x+h) - f(x) =$$

(c) (3 points)

$$\frac{f(x+h) - f(x)}{h} =$$

(d) (3 points)

$$f'(x) =$$

4. (24 points) Compute the following quantities. You may use shortcuts.

(a) (8 points)

$$f'(x) \qquad \text{for} \qquad f(x) = x^5 - 2x^3 + 4x$$

(b) (8 points)

$$\frac{d}{dx} f(x) \qquad \text{for} \qquad f(x) = \frac{1}{x^2} - 6x$$

(c) (8 points)

$$y' \qquad \text{for} \qquad y = 5\sqrt{x} + x^3$$

5. (12 points) Find the equation of the tangent line to $f(x) = x^5 - 2x^3 + 4x$ at $x = 1$. *Hint*: use your answer to part (a) of the previous page.

6. (6 points) Suppose \$1000 is invested for 3 years with continuous compounding. At the end of the 3 years, the investment is worth \$1500. Find r, the annual rate of compounding. *Hint*: the formula for continuous compounding is $A = Pe^{rt}$.