

Name: _____

UNIT 1 EXAM

Show ALL of your work for full credit

1. Expand $(a + b)(c + d + e + g)$

2. a) Expand $(x + 1)^{12}$

b) Explain how you got your answer.

3. a) Find $\lim_{x \rightarrow 0^+} \frac{4}{x}$

b) Explain why this happens and why it makes sense using words.

c) Find $\lim_{x \rightarrow \infty} \frac{4}{x}$

d) Explain why this happens and why it makes sense using words.

4. a) Use the calculator to find the following limit, or say the limit does not exist:

$$\lim_{x \rightarrow \infty} \frac{(\sin x)(\log x)}{x}$$

b) Explain in words what you did on your calculator to get this answer.

5. Use the charts below to find each limit. (**Warning: these are made-up functions. Don't try to identify them!**)

a)

x	$f(x)$
3.2	8.5
3.1	8.15
3.01	8.09
3.001	8.01
2.999	7.99
2.99	7.92
2.9	7.8
2.8	7.6
2.7	7.5

$$\lim_{x \rightarrow 3} f(x) =$$

b)

x	$f(x)$
80	1
100	-1
1200	1
14000	-1
300000	1
5000000	-1
60000000	1
700000000	-1
9000000000	1

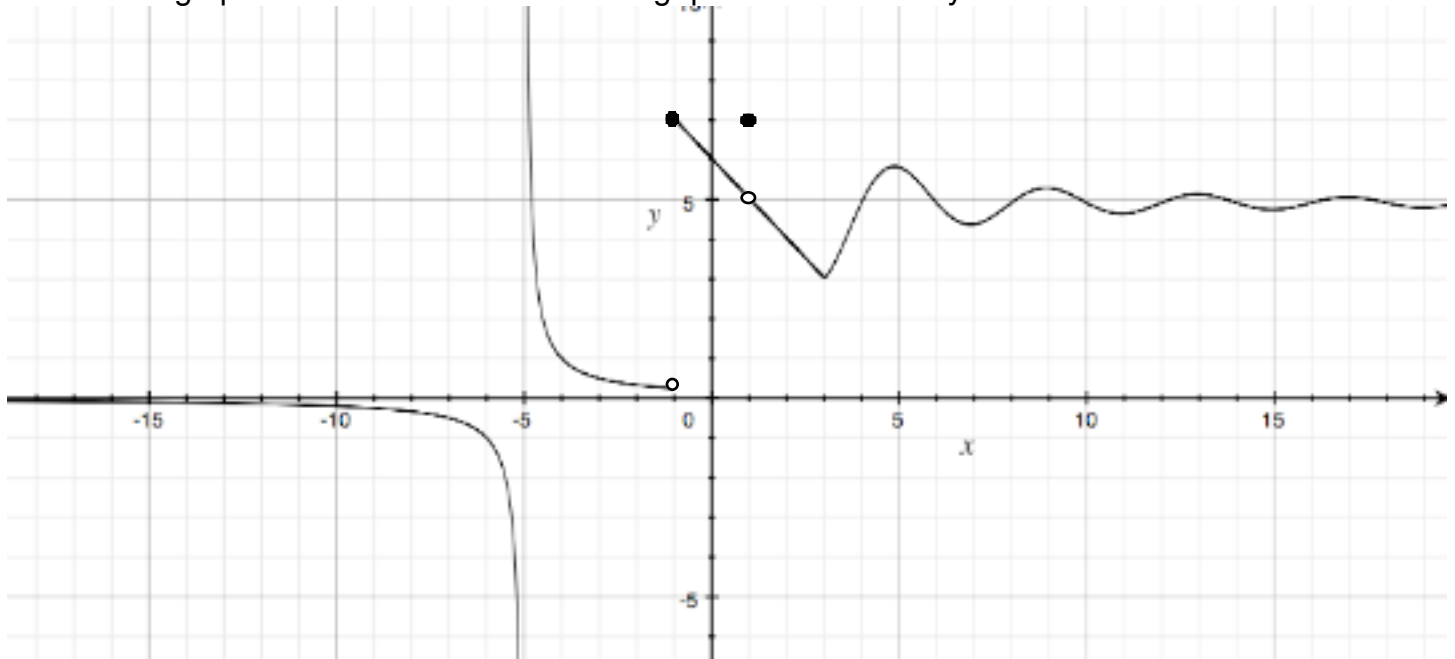
$$\lim_{x \rightarrow \infty} f(x) =$$

c)

x	$f(x)$
6.8	14.75
6.9	14.89
6.99	14.95
6.999	14.99
7.2	-9.5
7.1	-9.7
7.01	-9.9
7.001	-9.99
7.0001	-9.999

$$\lim_{x \rightarrow 7} f(x) =$$

6. Use the graph below to answer the following questions. You may have to estimate.



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

b) $\lim_{x \rightarrow \infty} f(x) =$

c) $\lim_{x \rightarrow -5^-} f(x) =$

d) $\lim_{x \rightarrow -5^+} f(x) =$

e) $\lim_{x \rightarrow 5} f(x) =$

f) $\lim_{x \rightarrow 1} f(x) =$

g) $f(1) =$

h) $\lim_{x \rightarrow -1^+} f(x) =$

i) $\lim_{x \rightarrow -1^-} f(x) =$

j) $\lim_{x \rightarrow -1} f(x) =$

k) $\lim_{x \rightarrow 3} f(x) =$

7. Find each limit. You must show pen & paper work for full credit.

a) $\lim_{x \rightarrow 3+} \frac{x+3}{x^2-9}$

b) $\lim_{x \rightarrow 0+} \frac{\sqrt{2-x} - 2}{x}$

c) $\lim_{x \rightarrow 4} \frac{x^2 - 7x + 12}{x - 4}$

d) $\lim_{x \rightarrow 0+} \frac{x^3 - 5x^2 + x - 3}{5x^3 + 7x}$

e) $\lim_{x \rightarrow 2} \frac{\sqrt{6-x} - 2}{\sqrt{3-x} - 1}$

f) $\lim_{x \rightarrow \infty} \frac{4x^4 + 2x^2 - 7x + 1}{9x^4 - 3x^3 - 5}$

g) $\lim_{x \rightarrow \infty} \frac{x+4}{x}$

h) $\lim_{x \rightarrow 0+} \frac{4x^2 + x^3 - 5x^4}{x^{-1} + 2x^4}$

i) $\lim_{x \rightarrow -1} \frac{2x^4 + 8x^3 + 12x^2 + 8x + 2}{x + 1}$

8. Let a , b , and c be real numbers.

a) What are all of the possible solutions to $\lim_{x \rightarrow \infty} \frac{x^a + x^b}{x^c} ?$

b) Explain what the limit would be given each scenario:

i. $b < a < c$

ii. $c < b < a$

iii. $b < c < a$

iv. $a = b = c$

9. $\lim_{x \rightarrow n+} f(x) \neq \lim_{x \rightarrow n-} f(x)$ where n is a real number.

a) Find $\lim_{x \rightarrow n} f(x)$

b) Is the function continuous or discontinuous around $x = n$? Explain.

10. Let $f(x)$ and $g(x)$ be two functions of x . $\lim_{x \rightarrow 3} g(x) = \lim_{x \rightarrow 3} f(x) = 8$

Find $\lim_{x \rightarrow 3} \frac{(g(x))^2 - (f(x))^2}{g(x) - f(x)}$