HW7: Unit 1 (Limits) Review

1) Complete the table for the function and find the indicate limit

1) $\lim_{x \to 2} \frac{3-x}{x-2}$

x						
$f(x)$						

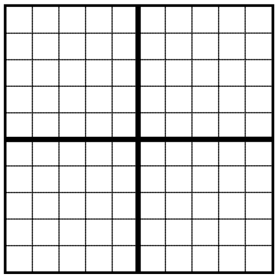
2) Complete the table for the function and find the indicate limit

2) $\lim_{x \to 0} \frac{\cos x - 1}{x^2 - x}$

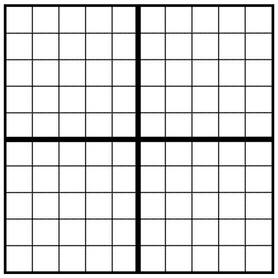
x						
$f(x)$						

Graph the following functions and use your graph to find the indicated limit

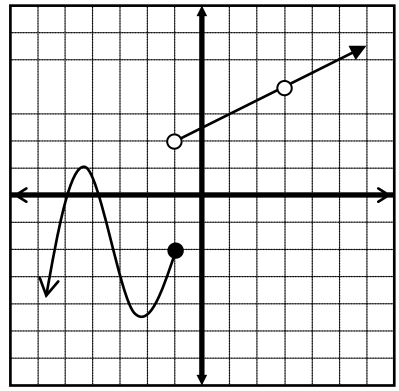
3) $f(x) = \begin{cases} 3x-1, & x < 2 \\ -x^2+1, & x \geq 2 \end{cases}$ $\lim_{x \to 2} f(x) =$ ________



4. $f(x) = \begin{cases} |x-2|, & x \leq 1 \\ 1, & x > 1 \end{cases}$ $\lim_{x \to 1} f(x) =$ ________



5. Use the graph to the right to find the following. (Assume that all tick marks are 1 unit apart.)



a. $\lim_{x\to 3^-} f(x) =$ ______

b. $\lim_{x\to 3^+} f(x) =$ ______

c. $\lim_{x\to 3} f(x) =$ ______

d. $\lim_{x\to -3^-} f(x) =$ ______

e. $\lim_{x\to -3^+} f(x) =$ ______

f. $\lim_{x\to -3} f(x) =$ ______

g. $\lim_{x\to 1^-} f(x) =$ ______

h. $\lim_{x\to -1^+} f(x) =$ ______

i. $\lim_{x\to -1} f(x) =$ ______

j. $f(-1) =$ ______

k. $f(3) =$ ______

6. Given $f(x) = \begin{cases} x^2 + 6 & x < 2 \\ x^3 + 2 & x \geq 2 \end{cases}$

a). $\lim_{x\to 2^-} f(x) =$

b). $\lim_{x\to 2^+} f(x) =$

c). $\lim_{x\to 2} f(x) =$

d) $f(2) =$

e). Is $f(x)$ continuous at $x = 2$? Why or why not

7. Given $f(x) = \begin{cases} x + 5 & x < 1 \\ x + 7 & x \geq 1 \end{cases}$

a). $\lim_{x\to 1^-} f(x) =$

b). $\lim_{x\to 1^+} f(x) =$

b). $\lim_{x\to 1} f(x) =$

d) $f(1) =$

e). Is $f(x)$ continuous at $x = 1$? Why or why not

Find the indicated limit.

8) $\lim_{x \to 2} \frac{x^3 - 2x^2 + 4x - 8}{x^4 - 2x^3 + x - 2}$

9) $\lim_{x \to 2} \frac{x^2 - 4x + 1}{3x - 5}$

10) $\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$

11) $\lim_{x \to 0} \frac{\frac{1}{x+5} - \frac{1}{5}}{x}$

12) $\lim_{x \to 3} \frac{\frac{1}{x} - \frac{1}{3}}{x - 3}$

13) $\lim_{x \to 3} \frac{x^2 - x - 2}{x^2 - 1}$

14) $\lim_{x \to 0} \frac{\sqrt{9 + x} - 3}{x}$

15) $\lim_{x \to 0} \frac{x}{\sqrt{x + 4} - 4}$

16) $\lim_{x \to 1} \frac{\sqrt{37 - x} - 6}{x - 1}$

17) $\lim_{t \to -\infty} \frac{x^3 + 1}{x^3 + 3x^2 + 5}$

18) $\lim_{x \to \infty} \frac{3x - 2}{5x^2 + 4x + 1}$

19) $\lim_{x \to \infty} \frac{2x^2 + 1}{3x - 5}$

Use the **<u>definition of continuity</u>** to determine whether *f*(*x*) is continuous at *a*.

20) $f(x)=\dfrac{x-2}{x^2-4}$ $\quad a=2$

21) $f(x)=\dfrac{x^2-4}{x-2}$ $\quad a=3$

22) $f(x)=\begin{cases} 5x & if \quad x<4 \\ 21 & if \quad x=4 \\ x^2+4 & if \quad x>4 \end{cases}, \quad a=4$

23) $f(x)=\begin{cases} 2x & if \quad x\le 0 \\ x^2+1 & if \quad 0<x\le 2 \\ 7-x & if \quad x>2 \end{cases}, \quad a=2$

Determine for what numbers, if any, the given function is discontinuous. Use the **definition of continuity** to show the discontinuity.

24) $f(x)=\dfrac{x+1}{x^2-3x-4}$

25) $f(x)=\begin{cases} \dfrac{x^2-1}{x-1} & if \quad x\ne 1 \\ 2 & if \quad x=1 \end{cases}$

A piecewise function is given. Use the **properties of limits** to find the indicated limits, or state that a limit does not exist.

26) $f(x)=\begin{cases} 1-x & if \quad x<1 \\ 2 & if \quad x=1 \\ x^2+3 & if \quad x>1 \end{cases}$ a) $\lim_{x\to 1^-} f(x)$ b) $\lim_{x\to 1^+} f(x)$ c) $\lim_{x\to 1} f(x)$

27) $f(x)=\begin{cases} \dfrac{x^2-25}{x+5} & if \quad x\neq 5 \\ 13 & if \quad x=5 \end{cases}$ a) $\lim_{x\to 5^-} f(x)$ b) $\lim_{x\to 5^+} f(x)$ c) $\lim_{x\to 5} f(x)$

28) Write the equation of the tangent line to the curve $y=3x^2-x+1$ at the point $(-1,5)$

29) Write the equation of the tangent line to the curve $y=\dfrac{3}{x}$ at the point (3, 1).

Answers to Unit-6 Test Review

1) DNE
2) 0
3) DNE
4) 1

5) a. $\lim_{x\to 3^-} f(x) = $ __4__
b. $\lim_{x\to 3^+} f(x) = $ __4__
c. $\lim_{x\to 3} f(x) = $ __4__
d. $\lim_{x\to -3^-} f(x) = $ __-3__
e. $\lim_{x\to -3^+} f(x) = $ __-3__
f. $\lim_{x\to -3} f(x) = $ __-3__
g. $\lim_{x\to 1^-} f(x) = $ __3__
h. $\lim_{x\to -1^+} f(x) = $ __2__
i. $\lim_{x\to -1} f(x) = $ __DNE__
j. $f(-1) = $ __-2__
k. $f(3) = $ undefined

6) a). $\lim_{x\to 2^-} f(x) = 10$
b). $\lim_{x\to 2^+} f(x) = 10$
c). $\lim_{x\to 2} f(x) = 10$
d) $f(2) = 10$
e). Is $f(x)$ continuous at $x = 2$? Why or why not
Yes because $\lim_{x\to 2} f(x) = f(2) = 10$

7) a). $\lim_{x\to 1^-} f(x) = 6$
b). $\lim_{x\to 1^+} f(x) = 8$
c). $\lim_{x\to 1} f(x) =$ DNE
d) $f(1) = 8$
e). Is $f(x)$ continuous at $x = 1$? Why or why not
No because $\lim_{x\to 1} f(x) =$ DNE

8) $\frac{8}{9}$
9) -3
10) 2
11) $-\frac{1}{25}$
12) $-\frac{1}{9}$
13) $\frac{1}{2}$
14) $\frac{1}{6}$
15) 0
16) $-\frac{1}{12}$
17) 1
18) 0
19) ∞

20) $f(x)$ is discontinuous at $x = 2$
21) $f(x)$ is continuous at $x = 3$
22) $f(x)$ is discontinuous at $x = 4$
23) $f(x)$ is continuous at $x = 2$
24) $f(x)$ is discontinuous at $x = -1, 4$
25) $f(x)$ is continuous at all values of x
26) a) 0 b) 4 c) DNE
27) a) 0 b) 0 c) 0
28) $y = -7x - 2$
29) $y = -\frac{1}{3}x + 2$