**AB Calculus Intro to Limits Homework** Name: Key

1. Using words, explain what is meant by the mathematical expression $\lim_{x \to c} f(x) = K$

On the curve of $f(x)$ K is the y-value that the curve approaches from the left & right of $x = c$

2. Use a graph and complete the table to investigate the value of the following limits. (Calculator)

a) $\lim_{x \to 1} \frac{x^2 - 4}{x - 1}$ DNE

| $x$ | .9 | .99 | .999 | 1 | 1.001 | 1.01 | 1.1 |
|---|---|---|---|---|---|---|---|
| $f(x)$ | 31.9 | 301.99 | 3002 | und | -2998 | -298 | -27.9 |

$\to \infty \neq \to -\infty$

b) $\lim_{x \to -3} \frac{x^2 + 4x + 3}{x^2 - 3} = 0$

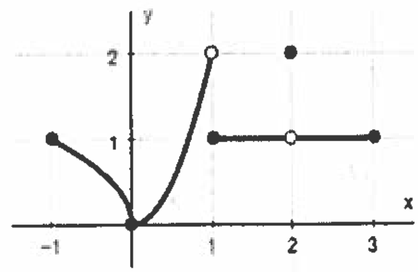
direct subst.

| $x$ | -3.1 | -3.01 | -3.001 | -3 | -2.999 | -2.99 | -2.9 |
|---|---|---|---|---|---|---|---|
| $f(x)$ | .03 | .003 | .0003 | 0 | -.0003 | -.003 | -.035 |

c) $\lim_{x \to 2} \frac{x^3 - 8}{x - 2} = 12$

| $x$ | 1.9 | 1.99 | 1.999 | 2 | 2.001 | 2.01 | 2.1 |
|---|---|---|---|---|---|---|---|
| $f(x)$ | 11.41 | 11.94 | 11.994 | und | 12.006 | 12.06 | 12.61 |

3. Determine whether each statement about the graph of $f(x)$ below is True or False.




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

b) $\lim_{x \to 2} f(x) = DNE$ F

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

d) $\lim_{x \to 1^-} f(x) = 2$ T

e) $\lim_{x \to c} f(x)$ exists at every c in the interval $(-1, 1)$ T

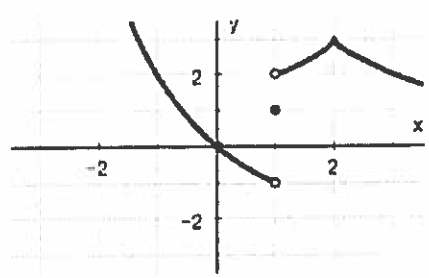
f) $\lim_{x \to 1^+} f(x) = 1$ T

g) $\lim_{x \to 1} f(x) = DNE$ T

h) $\lim_{x \to 0^+} f(x) = \lim_{x \to 0^-} f(x)$ T

i) $\lim_{x \to c} f(x)$ exists at every c in the interval $(1, 3)$ T

4. Use the graph of $f(x)$ to find the following.




a) $\lim_{x \to 1^+} f(x) = 2$

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

c) $\lim_{x \to 1} f(x)$ DNE

d) $f(1) = 1$

e) $\lim_{x \to 2^+} f(x) = 3$

f) $\lim_{x \to 2^-} f(x) = 3$

g) $\lim_{x \to 2} f(x) = 3$

h) $f(2) = 3$

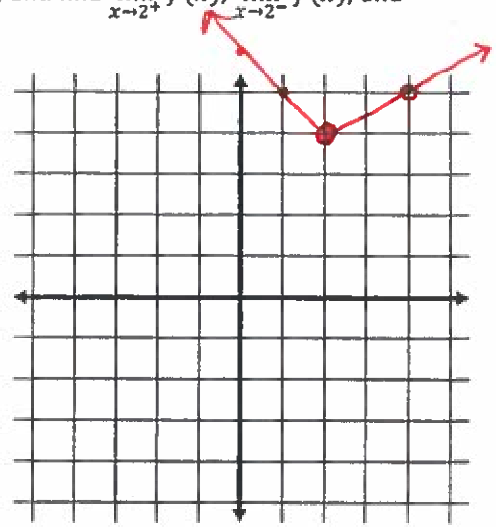
5. For the following function, draw the graph on the grid provided, and find $\lim_{x\to 2^+} f(x)$, $\lim_{x\to 2^-} f(x)$, and $\lim_{x\to 2} f(x)$ or explain why it does not exist.

$$f(x) = \begin{cases} 6-x, & x<2 \\ 4, & x=2 \\ \frac{x}{2}+3, & x>2 \end{cases}$$

$6-2=4$

$=4$

$\frac{2}{2}+3=4$

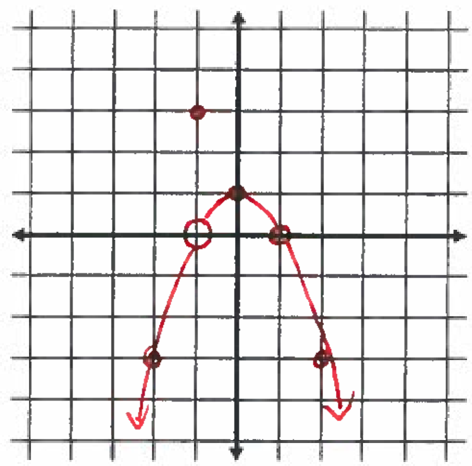


all 3 are 4

6. For the following function, draw the graph on the grid provided, and find $\lim_{x\to -1^+} f(x)$, $\lim_{x\to -1^-} f(x)$, and $\lim_{x\to -1} f(x)$ or explain why it does not exist.

$$f(x) = \begin{cases} 1-x^2, & x \neq -1 \\ 3, & x=-1 \end{cases}$$

$1-(-1)^2 = 1-1=0$



$\lim_{x\to -1^+} = 0$

$\lim_{x\to -1} = 0$

$\lim_{x\to -1^-} = 0$

7. Given that $\lim_{x\to c} f(x) = 7$ and $\lim_{x\to c} g(x) = 4$, evaluate the following limits.

a) $\lim_{x\to c}[3g(x)]$ $3\cdot 4 = 12$

c) $\lim_{x\to c}[g(x)-f(x)]$ $4-7=-3$

b) $\lim_{x\to c}[f(x)g(x)]$ $7\cdot 4 = 28$

d) $\lim_{x\to c}\frac{f(x)}{g(x)}$ $\frac{7}{4}$

8. Evaluate the following limits.

a) $\lim_{x\to 1}(x^3+3x^2-2x-17)$

$1+3-2-17=-15$

c) $\lim_{y\to 2}\frac{y^2+5y+6}{y+2}$ $\frac{2^2+10+6}{4} = \frac{20}{4} = 5$

b) $\lim_{x\to -2}(x-6)^{\frac{2}{3}}$

$(-2-6)^{\frac{2}{3}} = -8^{\frac{2}{3}} = \sqrt[3]{(-8)^2}$

$= \sqrt[3]{64} = 4$

d) $\lim_{x\to -2}\sqrt{x-2}$ $= \sqrt{-4}$ DNE