1) $f(a)$ is defined 2) $\lim_{x \to a} f(x)$ exists 3) $\lim_{x \to a} f(x) = f(a)$

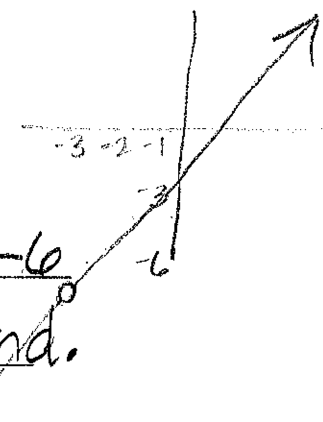
Limits and Continuity

Calculus Concepts

Unit 1 – Worksheet 3

Name key

Date



1. Let $f(x) = \dfrac{x^2 - 9}{x + 3}$. $= \dfrac{(\cancel{x+3})(x-3)}{\cancel{x+3}}$

   a. $\lim\limits_{x \to -3^-} f(x) =$ -6

   b. $\lim\limits_{x \to -3^+} f(x) =$ -6

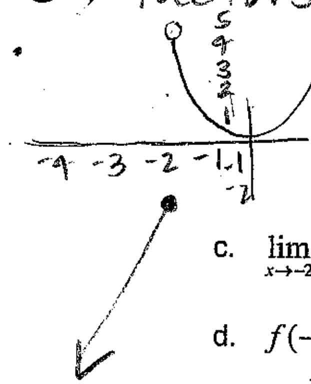
   c. $\lim\limits_{x \to -3} f(x) =$ -6

   d. $f(-3) =$ und.

   e. Is continuous at $x = -3$? no Why or why not? hole If it is not continuous, state the type of discontinuity and explain why it has that type of discontinuity.

#1 X

$\boxed{\text{not cont}}$, hole @ $x = -3$, factors cancel on top: bottom $f(-3)$ is und.



2. Let $f(x) = \begin{cases} 3x + 4 & x \le -2 \\ x^2 + 1 & x > -2 \end{cases}$.

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

   b. $\lim\limits_{x \to -2^+} f(x) =$ 5

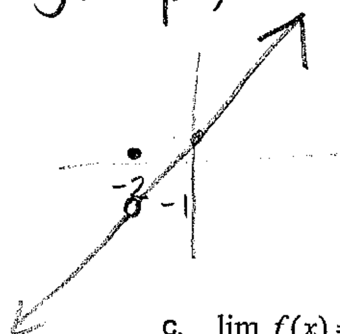
   c. $\lim\limits_{x \to -2} f(x) =$ dne

   d. $f(-2) =$ -2

   e. Is continuous at $x = -2$? Why or why not? If it is not continuous, state the type of discontinuity and explain why it has that type of discontinuity.

#2 X

no, $\lim\limits_{x \to -2}$ dne, it's a jump, it's piecewise



3. Let $f(x) = \begin{cases} \dfrac{x^2 + 3x + 2}{x + 2} & x \ne -2 \\ \dfrac{1}{2} & x = -2 \end{cases}$. $\dfrac{(x+2)(x+1)}{\cancel{x+2}}$

   a. $\lim\limits_{x \to -2^-} f(x) =$ -1

   b. $\lim\limits_{x \to -2^+} f(x) =$ -1

   c. $\lim\limits_{x \to -2} f(x) =$ -1

   d. $f(-2) =$ $\frac{1}{2}$

   e. Is continuous at $x = -2$? Why or why not? If it is not continuous, state the type of discontinuity and explain why it has that type of discontinuity.

#3 X

no, $\lim\limits_{x \to -2} f(x) \ne f(-2)$, a hole, factors cancel on top : bottom

4. Given $f(x)=\begin{cases}3x+2 & \text{if } x<4\\ 5x+k & \text{if } x\geq 4\end{cases}$.

Find the value of k such that $\lim_{x\to 4} f(x)$ exists.

$5x+k=14$

(4)

$k=-6$

5. Given $f(x)=\begin{cases}2x-a & \text{if } x<-3\\ ax+2b & \text{if } -3\leq x\leq 3\\ b-5x & \text{if } x>3\end{cases}$.

Find the values of a and b such that $\lim_{x\to -3} f(x)$ and $\lim_{x\to 3} f(x)$ both exist.

Limits and Continuity
Calculus Concepts
Unit 1 – Worksheet 4

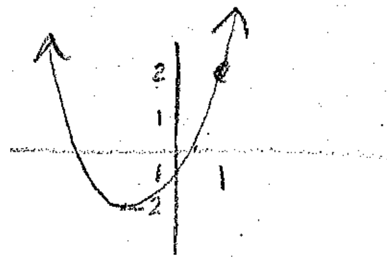
Name

Date

Please show all work.
Full credit will not be given if appropriate work is not shown.

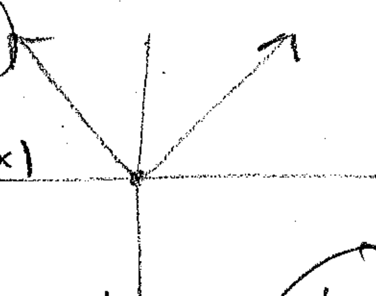
Find each of the following limits. Please use proper notation.

1. $\lim_{x\to 1}(x^2+2x-1)$ direct sub

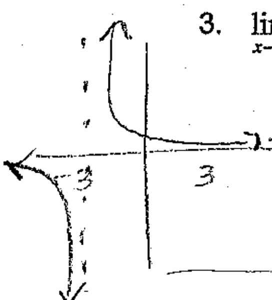


$1^2+2(1)-1$
$1+2-1 = 3-1 = 2$

2. $\lim_{x\to 0}|x|$ direct sub $|0| = 0$

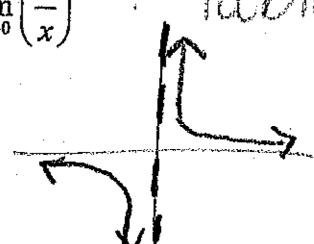


3. $\lim_{x\to 3}\left(\frac{x-3}{x^2-9}\right)$ $\frac{\cancel{x-3}}{(\cancel{x-3})(x+3)} = \frac{1}{x+3} = \frac{1}{3+3} = \frac{1}{6}$



factor and cancel, then direct sub

4. $\lim_{x\to 0}\left(\frac{1}{x}\right)$ Table and graph V.A. $x=0$

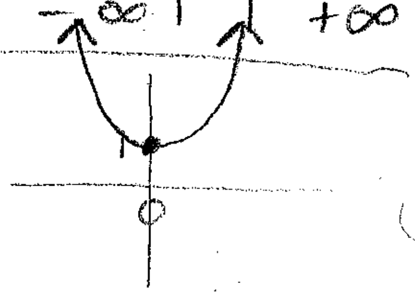


dne

-.0001	0	.0001
-10,000	dne	10,000
$-\infty$		$+\infty$

factor top 5. $f(x)=\begin{cases}\frac{x^3-1}{x-1} & \text{if } x\neq 0\\ 1 & \text{if } x=0\end{cases}$; $\lim_{x\to 0} f(x) = 1$

hole @ $x=1$ $\frac{(x-1)(x^2+x+1)}{x-1}$



this fills the hole

* When you sub/plug into both you get the same 'y' value