Worksheet Piecewise Functions Name: Key

Part I. Carefully graph each of the following. Graph the functions and answer the following questions.

1. $f(x) = \begin{cases} x+5 & x < -2 \\ x^2+2x+3 & x \geq -2 \end{cases}$

$f(3) = (3)^2+2(3)+3 = 9+6+3 = \boxed{18}$

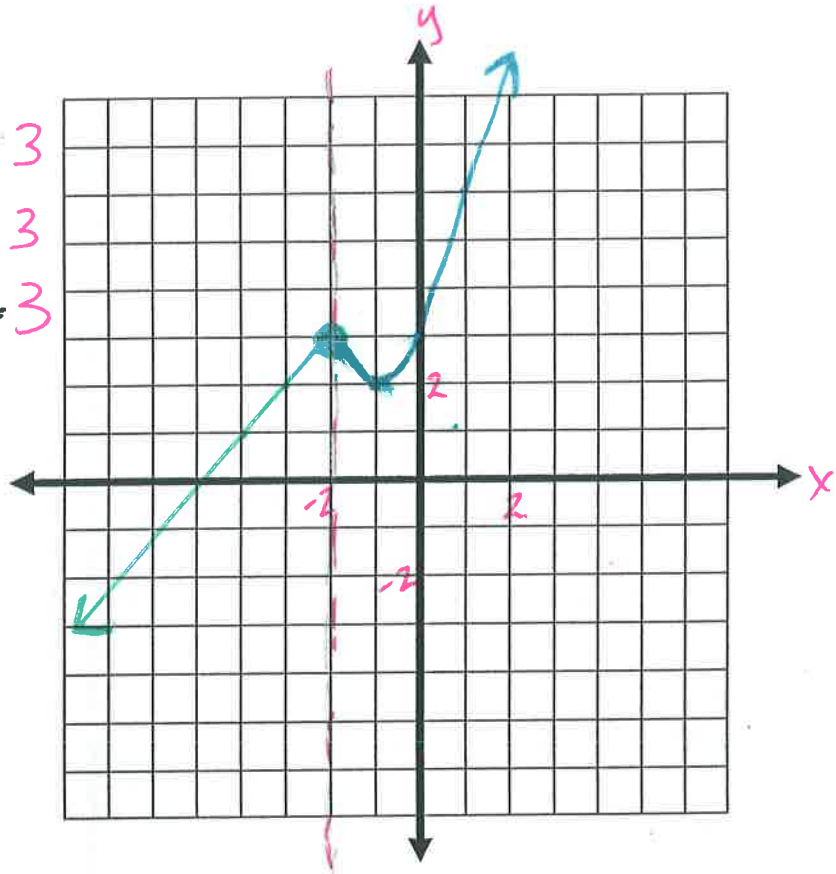
$f(-4) = -4+5 = \boxed{1}$

$f(-2) = (-2)^2+2(-2)+3 = 4-4+3 = \boxed{3}$

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

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

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



State where the function is Continuous.

$\mathbb{R}$

State where the function is Discontinues.

$\emptyset$

State any holes or asymptotes.

none

2. $f(x) = \begin{cases} 2x+1 & x \geq 1 \\ x^2+3 & x < 1 \end{cases}$

State where the function is Continuous.

$\mathbb{R}, x \neq 2$

State where the function is Discontinues.

$x = 2$

State any holes or asymptotes.

hole @ $x=2$

$f(-2) = (-2)^2+3 = 4+3 = \boxed{7}$

$f(6) = 2(6)+1 = 12+1 = \boxed{13}$

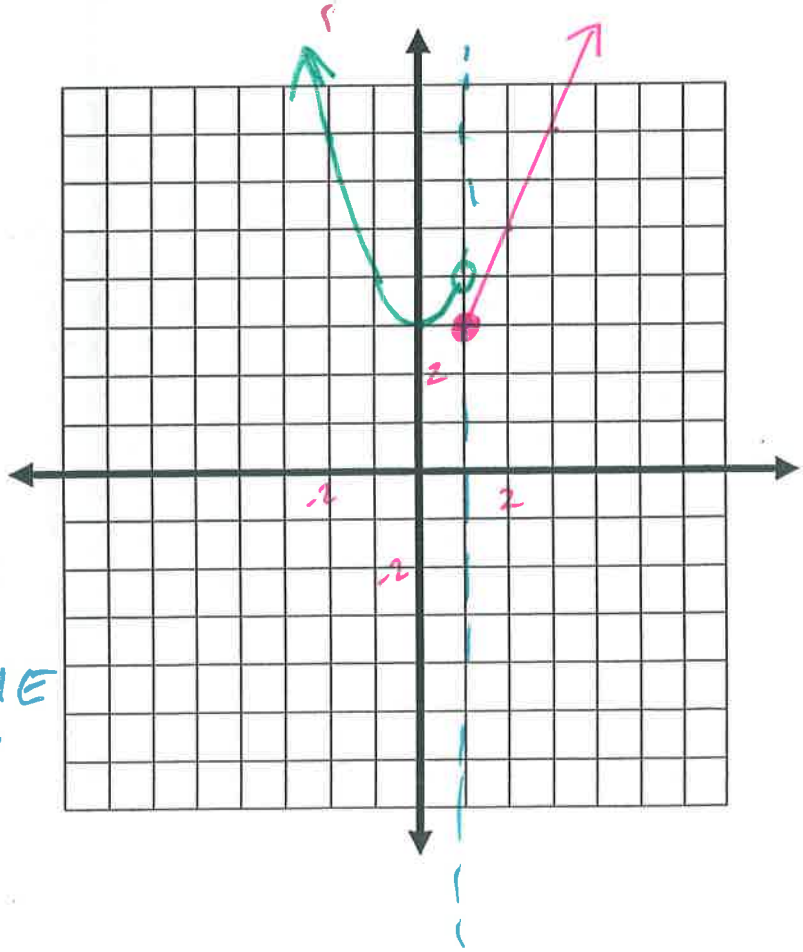
$f(1) = 2(1)+1 = 2+1 = \boxed{3}$

$\lim_{x \to 1^-} f(x) = 4$

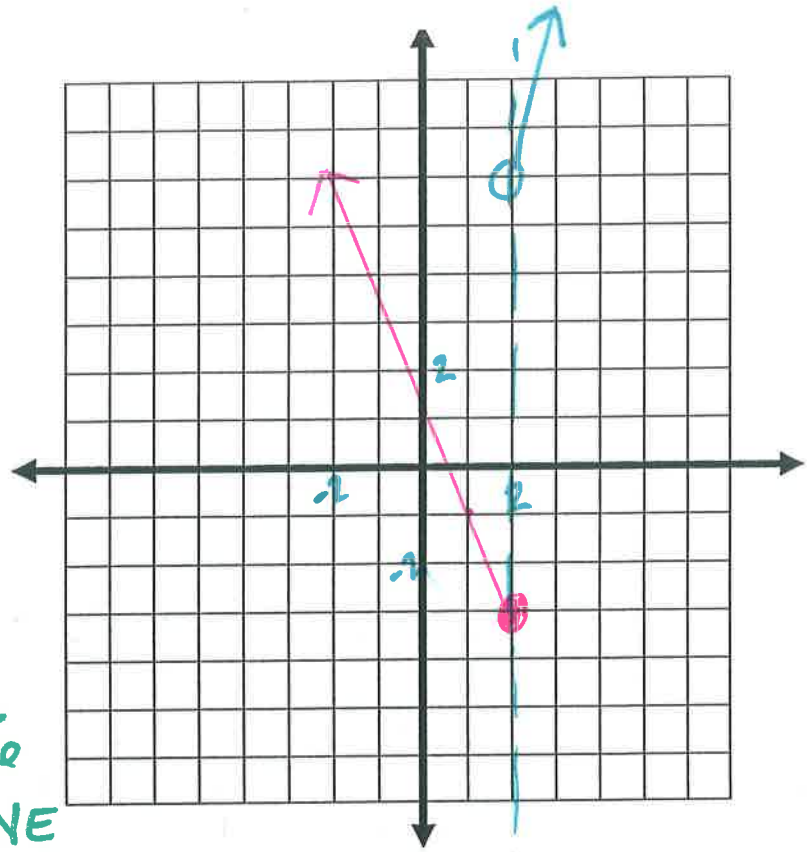
$\lim_{x \to 1^+} f(x) = 3$

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

$\lim_{x \to -2} f(x) = 7$



3. $f(x) = \begin{cases} -2x+1 & x \le 2 \\ 5x-4 & x > 2 \end{cases}$



State where the function is Continuous.

$\mathbb{R}, x \neq 2$

State where the function is Discontinues.

$x = 2$

State any holes or asymptotes.

hole @ $x = 2$ / OR $(2, 6)$

$f(-4) = -2(-4)+1$
$= 8+1$
$= \boxed{9}$

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

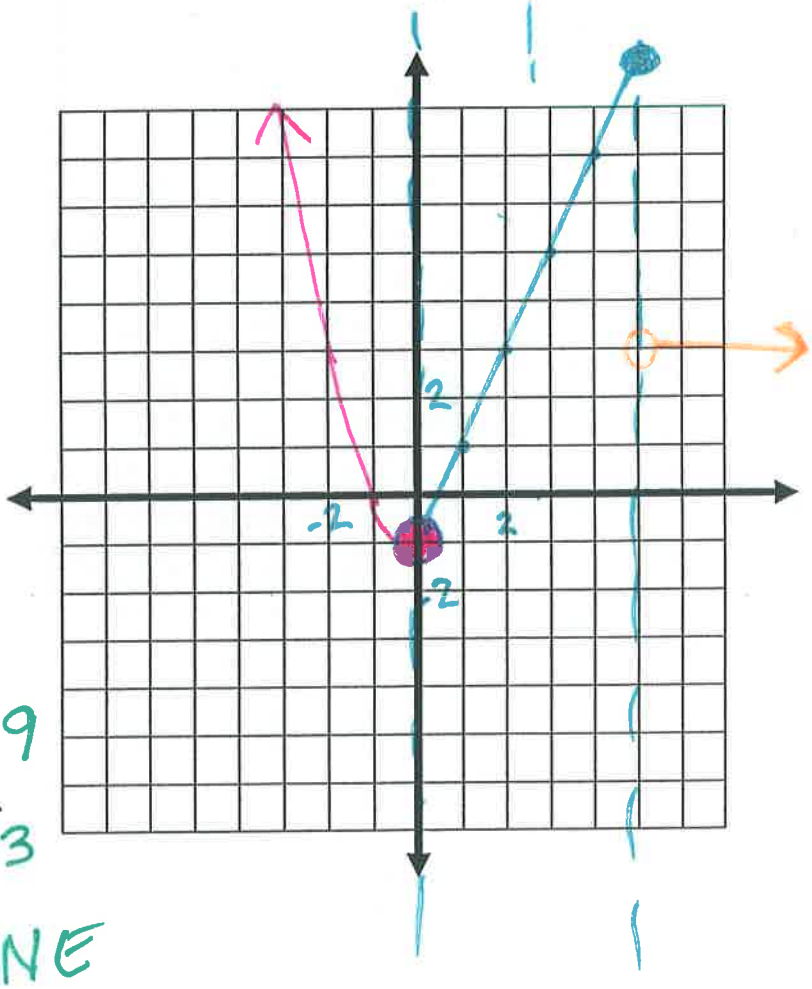
$f(8) = 5(8)-4$
$= 40-4$
$= \boxed{36}$

$\lim_{x \to 2^+} f(x) = 6$

$f(2) = -2(2)+1$
$= -4+1$
$= \boxed{3}$

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

4. $f(x) = \begin{cases} x^2-1 & x \le 0 \\ 2x-1 & 0 < x \le 5 \\ 3 & x > 5 \end{cases}$



State where the function is Continuous.

$\mathbb{R}\ x \neq 5$

State where the function is Discontinues.

$x = 5$

State any holes or asymptotes.

hole @ $x = 5$ / OR $(5, 3)$

$f(-2) = (-2)^2 - 1$
$= \boxed{3}$

$\lim_{x \to 0} f(x) = -1$

$f(0) = 0^2 - 1$
$= \boxed{-1}$

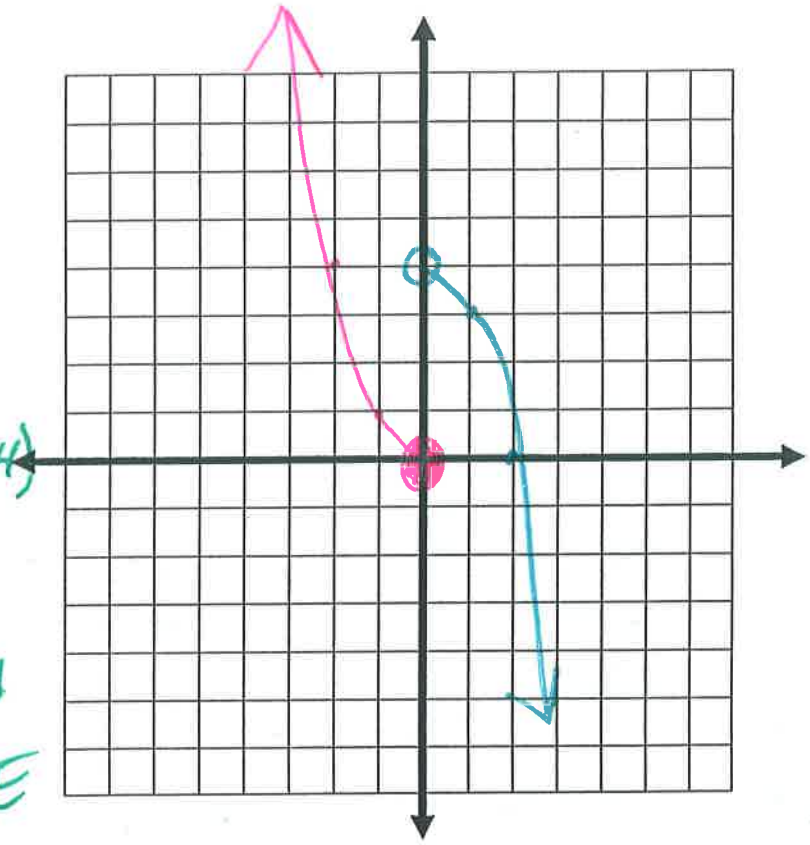
$\lim_{x \to 5^-} f(x) = 9$

$f(5) = 2(5)-1$
$= 10-1$
$\boxed{9}$

$\lim_{x \to 5^+} f(x) = 3$

$\lim_{x \to 5} f(x) =$ DNE

5. $f(x) = \begin{cases} x^2 & x \le 0 \\ -x^2 + 4 & x > 0 \end{cases}$



State where the function is Continuous.

$\mathbb{R}, x \neq 0$

State where the function is Discontinues.

$x = 0$

State any holes or asymptotes. hole @ (0,4)

$f(-4) = (-4)^2 = \boxed{16}$

$f(0) = (0)^2 = \boxed{0}$

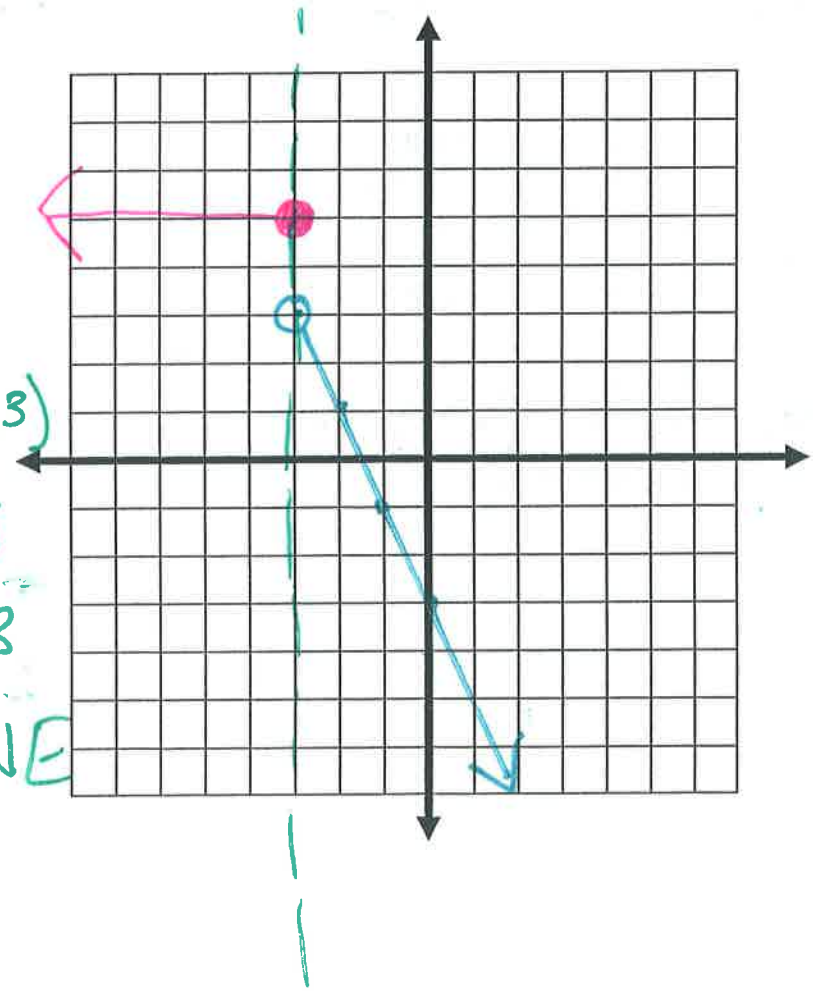
$f(3) = -(3)^2 + 4$
$-9 + 4$
$= \boxed{-5}$

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

$\lim_{x \to 0^+} f(x) = 4$

$\lim_{x \to 0} f(x) =$ DNE

6. $f(x) = \begin{cases} 5 & x \le -3 \\ -2x - 3 & x > -3 \end{cases}$



State where the function is Continuous.

$\mathbb{R}\ x \neq -3$

State where the function is Discontinues.

$x = -3$

State any holes or asymptotes. hole @ (-3,3)

$f(-4) = \boxed{5}$

$f(0) = -2(0) - 3 = \boxed{-3}$

$f(3) = -2(3) - 3$
$= -6 - 3$
$= \boxed{-9}$

$\lim_{x \to -3^-} f(x) = 5$

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

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