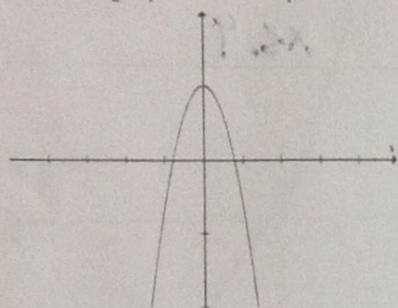
Pre-Calculus  Name: Key  Date:  Period:

## Pre-Calculus Unit 1 Practice Test

*Complete the problems below and show your work.*

Target 1A: I can identify functions from data tables, graphs, and descriptions of set relations.

1. Does the graph below represent a function? Explain.



Yes, it passes the Vertical line test

2. Does the table represent a function? Explain why or why not.

| | | | | | |
|---|---|---|---|---|---|
| $x$ | 4 | 1 | −3 | 8 | 1 |
| $y$ | 2 | 6 | 3 | 8 | 9 |

No, there are two ranges for each domain.

3. If $f(x) = -x^2 + 2$ evaluate

a. $f(2)$ $\quad f(2) = -(2)^2 + 2 = -4 + 2 = -2$

b. $f(-1)$ $\quad f(-1) = -(-1)^2 + 2 = -1 + 2 = 1$

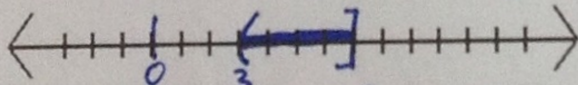
c. $f(3) - f(1)$ $\quad f(3) - f(1) = (-(3)^2 + 2) - (-(1)^2 + 2) = (-7) - (1) = -8$

Target 1B: I can describe a set of numbers in a variety of ways.

**For each of the following, fill in the missing type of interval or graph. Describe the interval as bounded, unbounded, open, closed, half-open.** (see back of 1B notes)

4. Interval $(3, 7]$ Inequality $3 < x \leq 7$

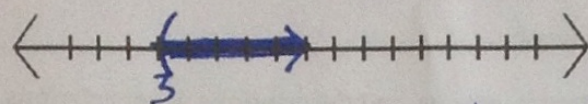
Graph



Description half-open, bounded (see back of 1B notes)

5. Interval $(3, \infty)$ Inequality $x > 3$

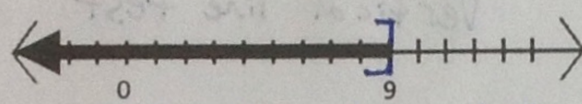
Graph




Description open interval, unbounded

6. Interval $(-\infty, 9]$ Inequality $x \leq 9$

Graph




Description closed, unbounded

7. Describe the set of numbers using interval notation.
$x \geq 5$ or $x < 11$

$(-\infty, 11) \cup [5, \infty)$

8. Describe the set of numbers using set-builder notation.
$\{-9, -8, -7, -6, -5, \ldots\}$

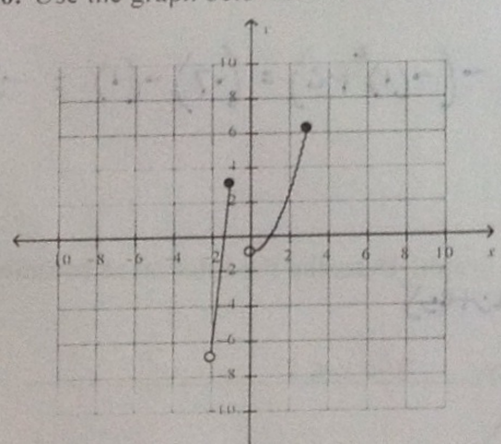
$\{x \mid x \geq -9,\ x \in \mathbb{R}\}$

9. Describe the domain and range of $y = \sqrt{x + 3}$ in interval notation.

Domain: $[-3, \infty)$

Range: $[0, \infty)$

10. Use the graph below to find the domain and range.




Domain: $(-2, -1] \cup (0, 3]$

Range: $(-7, 6]$

or $(-7, 6.1]$

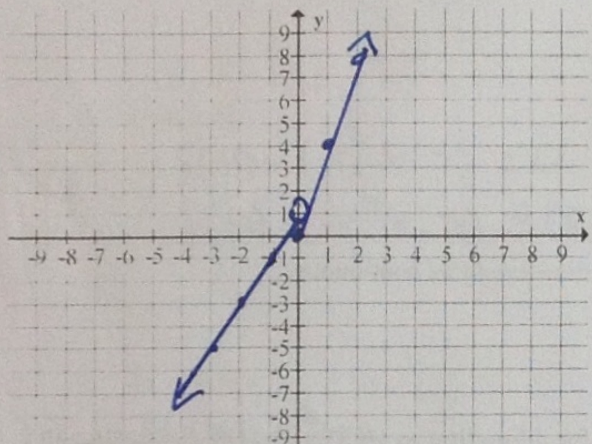
11. Find the domain and range of the relation $\{(-2,4), (3,5), (4,-2), (3,8)\}$ and explain if it determines a function.

D: $\{-2, 3, 4\}$

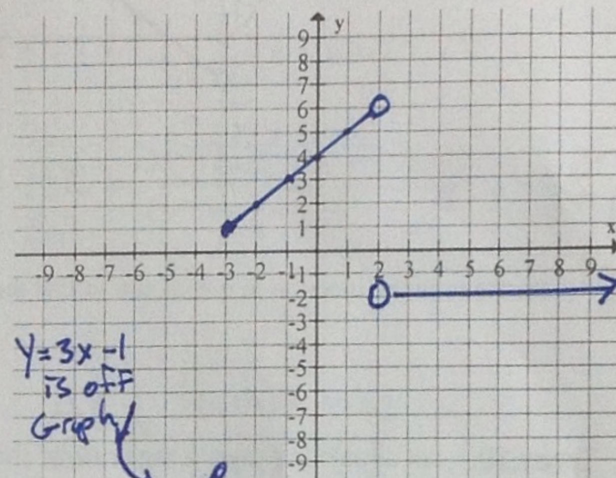
R: $\{-2, 4, 5, 8\}$

Target 1C: I can define, interpret, and use piecewise functions in function notation and as a graph.

12. Graph $f(x) = \begin{cases} 2x + 1 \; if \; x < 0 \\ 4x \; if \; x \geq 0 \end{cases}$

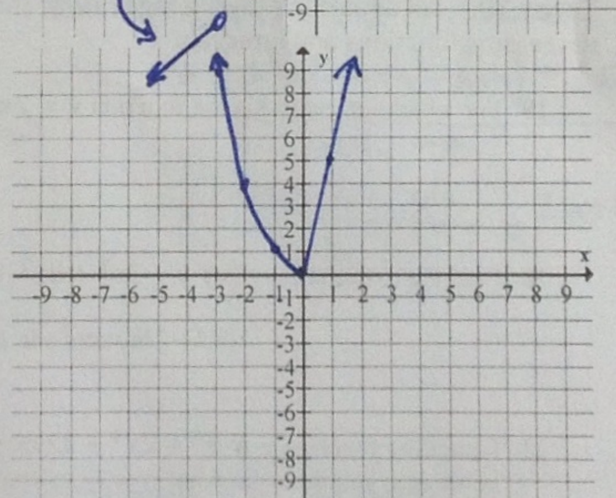


13. Graph $f(x) = \begin{cases} 3x - 1 \; if \; x < -3 \\ x + 4 \; if \; -3 \leq x < 2 \\ -2 \; if \; x > 2 \end{cases}$

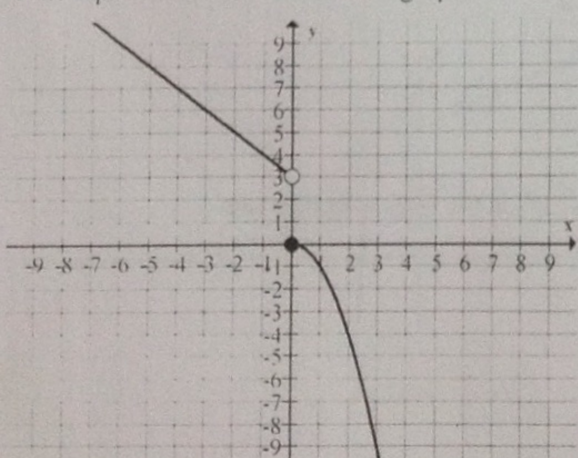


$y = 3x - 1$ is off Graph

14. Graph $f(x) = \begin{cases} x^2 if \; x < 0 \\ 5x \; if \; x \geq 0 \end{cases}$



15. Write a piecewise function for the graph below.



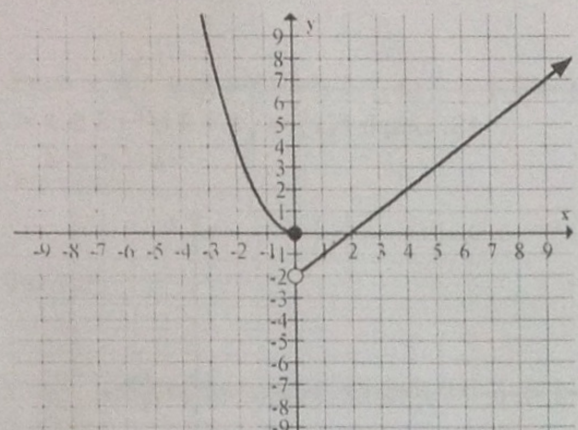
$f(x) = \begin{cases} -x+3, & x<0 \\ -x^2, & x \geq 0 \end{cases}$

16. Rewrite the function in the previous question so that the function would be continuous.

$f(x) = \begin{cases} -x, \text{ if } x<0 \\ -x^2, \text{ if } x \geq 0 \end{cases}$

or $f(x) = \begin{cases} -x+3, \text{ if } x<0 \\ -x^2+3, \text{ if } x \geq 0 \end{cases}$

17. Write a piecewise function for the graph below.



$$y = \begin{cases} x^2, & \text{if } x \le 0 \\ x-2, & \text{if } x > 0 \end{cases}$$

18. Rewrite the function in question 6 so that the function would be continuous.

$$y = \begin{cases} x^2-2, & \text{if } x \le 0 \\ x-2, & \text{if } x > 0 \end{cases}$$

or

$$y = \begin{cases} x^2, & \text{if } x \le 0 \\ x, & \text{if } x > 0 \end{cases}$$

Target 1D: I can determine the average rate of change for a function as well as identify increasing and decreasing functions and intervals.

19. For which interval(s) is the function $y = 2x^3 - 8x + 5$ increasing and decreasing?

Increasing: $(-\infty, -1.15) \cup (1.15, \infty)$

Decreasing: $(-1.15, 1.15)$

20. Find the extrema for $f(x) = -3x^3 + 8x^2 + 10x - 9$ name the specific type of extrema.

Local Minimum: $(-.49, -11.63)$

Local Maximum: $(2.27, 19.83)$

21. Graph the function $y = x^4 + 2x^3 + 3x$ on your calculator. Find the x-value of any extrema to the nearest hundredth and describe what type of extrema it is.

Global minimum $(-1.75, -6.6)$

22. Find the average rate of change for $f(x) = x^3 - x^2$ on the following intervals.

a. $[0, 4]$

$f(0) = 0^3 - 0^2 = 0$

$f(4) = 4^3 - 4^2 = 48$

$\frac{\Delta y}{\Delta x} = \frac{f(4) - f(0)}{4 - 0} = \frac{48 - 0}{4}$

$= \boxed{12}$

b. $[-4, -3]$

$f(-4) = (-4)^3 - (-4)^2 = -80$

$f(-3) = (-3)^3 - (-3)^2 = -36$

$\frac{\Delta y}{\Delta x} = \frac{f(-3) - f(-4)}{(-3) - (-4)} = \frac{(36) - (-80)}{1}$

$= \boxed{44}$

**23.** Find the average rate of change for $f(x) = x^2 + x$ on the following intervals.

a. $[1,3]$

$f(1) = (1)^2 + (1) = 2$

$f(3) = (3)^2 + (3) = 12$

$\frac{\Delta y}{\Delta x} = \frac{f(3)-f(1)}{3-1} = \frac{12-2}{3-1} = \frac{10}{2} = \boxed{5}$

b. $[-4,-1]$

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

$f(-4) = (-4)^2 + (-4) = 12$

$\frac{\Delta y}{\Delta x} = \frac{f(-4)-f(-1)}{(-4)-(-1)} = \frac{12-0}{-3} = \frac{12}{-3} = \boxed{-4}$

c. $[a, a+h]$

$f(a) = a^2 + a$

$f(a+h) = (a+h)^2 + (a+h)$

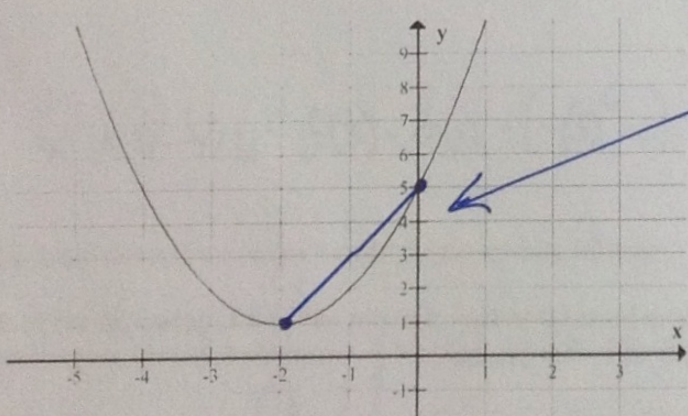
$= (a^2 + 2ah + h^2) + (a+h)$

$\frac{\Delta y}{\Delta x} = \frac{f(a+h) - f(a)}{(a+h) - (a)}$

$= \frac{(a^2 + 2ah + h^2 + a + h) - (a^2 + a)}{a + h - a}$

$= \frac{2ah + h^2 + h}{h} = 2a + h + 1$

**24.** Find the average rate of change for the graph below on the interval $[-2,0]$.




Slope of secant line is the rate of change

$\frac{\Delta y}{\Delta x} = \frac{4}{2} = \boxed{2}$