Day	Date	Assignment (Due the next class meeting)
		1.1 Worksheet (Solving Equations) **Read syllabus!** **Pay Lab Fee $3.00**
		1.2 Worksheet (Domain and Range) *Have you paid your lab fee?*
		1.3 Worksheet (Functions and Function Notation)
		1.4 Worksheet (Graphing Lines)
		1.5 Worksheet (Solving Linear Systems)
		1.6 Worksheet (Parent Functions and Transformations)
		1.7 Worksheet (Solving Absolute Value Functions)
		1.8 Worksheet (Piecewise Functions)
		Unit 1 Practice Test **STUDY for your test!** *Have you paid your lab fee?* *Have you returned your signed syllabus?* **Next class is the LAST DAY you can turn in any late assignments from this unit.**
		Unit 1 Test

- ✸ Be prepared for section quizzes.
- ✸ Every student is expected to do every assignment for the entire unit in order to be eligible for a test retake.
- ✸ Students who complete *every assignment* for this semester are eligible for a 2% semester grade bonus.
- ✸ Try www.mathguy.us (Earl's website) if you need help.

1.1 Notes: Solving Equations

Objectives:

- **Students will solve linear equations in one variable.**
- **Students will solve linear inequalities.**

Remember when? For #1-10, If needed, write your *answer as a simplified fraction*. No decimals!

1) $9x + 8 - 2x + 7 = -14$

$7x + 15 = -14$

$7x = -29$

$\boxed{x = -\frac{29}{7}}$

2) $-3(2a - 1) - 4a = 15$

$-6a + 3 - 4a = 15$

$-10a = 12$

$a = -\frac{12}{10} = \boxed{-\frac{6}{5}}$

3) $4y + 11 = 13y - 2(5 + 3y)$

$-4y \quad -4y$

$11 = 9y - 10 - 6y$

$21 = 3y$

$\boxed{y = 7}$

4) $-11 + \frac{5}{4}x = 9$

$\frac{4}{5} \cdot \frac{5}{4}x = 20 \cdot \frac{4}{5}$

$\boxed{x = 16}$

5) $\frac{7x+1}{3} - 5 = 6$

$\frac{7x+1}{3} = 11$

$7x + 1 = 33$

$7x = 32$

$\boxed{x = \frac{32}{7}}$

6) $\frac{4}{3-x} = \frac{-2}{2+x}$

$4(2+x) = -2(3-x)$

$8 + 4x = -6 + 2x$

$2x = -14$

$\boxed{x = -7}$

7) **Solve for *y*:** $3x - 5y = -15$

$-3x \quad -3x$

$\frac{-5y}{-5} = \frac{-3x}{-5} - \frac{15}{-5}$

$\boxed{y = \frac{3}{5}x + 3}$

8) **Solve for *y*:** $y + 3 = -(x - 4)$

$y + 3 = -x + 4$

$\boxed{y = -x + 1}$

9) $-5b^2 = -20$

$\frac{-5b^2}{-5} = \frac{-20}{-5}$

$b^2 = 4$

$\boxed{b = \pm 2}$

10) $3h^2 - 10 = 17$

$3h^2 = 27$

$h^2 = 9$

$\boxed{h = \pm 3}$

When you are ***solving an equation***, what are you trying to do? $=$	You are trying to solve for ONE point that satisfies the function
What happens when you are ***solving an Inequality***? $\geq, \leq$ or $>, <$	Same idea but you are looking for a RANGE of Values. (Remember to switch inequality ~~when ÷ by a negative~~).

For #11 – 12, solve each inequality.

11) $2x + 5 < 19$

$2x < 14$

$\boxed{x < 7}$

12) $-3x + 4 \geq 28$

$\frac{-3x}{-3} \geq \frac{24}{-3}$

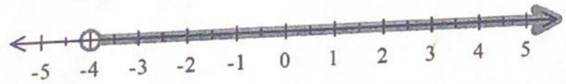
$\boxed{x \leq -8}$

1.2 Notes: Domain and Range

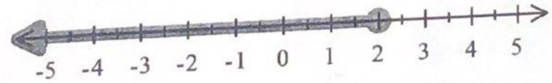
Objectives:

- **Students will use set notation and interval notation.**
- **Students will determine domain and range.**

Exploration: With a partner, try to describe the shaded portion of each number line any way you can.

a) 

$x > -4$

b) 

$x \leq 2$

c) 

$-3 < x \leq 1$

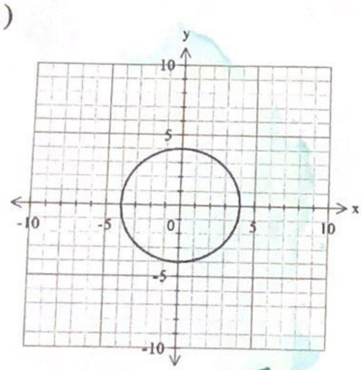
There are *two different* ways to describe an interval.	
Set Notation	$\{x \mid x > 0\}$ The set of all xs; such that; x is greater than 0. use $>, <$ for ○; $\geq, \leq$ for ●
Interval Notation	$(-2, 3]$ use ( ) for ○; [ ] for ●

Domain and Range (of a graph)

The *domain* of a function	The input, x, values
The *range* of a function	The output, y, values
A graph of a function	For every input there is exactly 1 output. The graph passes the vertical line test.

For #1-5, state the domain and range in <u>interval notation</u>.

1)

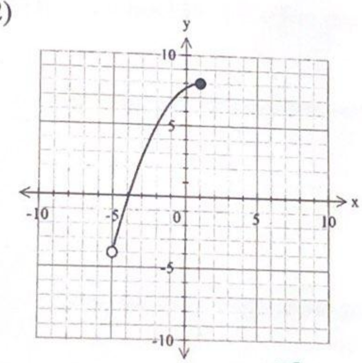


Domain: $[-4, 4]$

Range: $[-4, 4]$

Function? No

2)

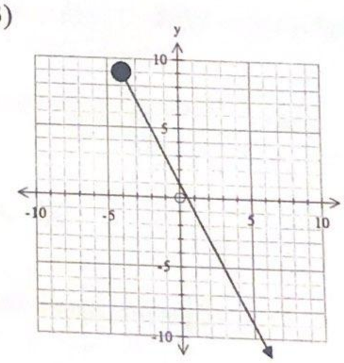


Domain: $(-5, 1]$

Range: $(-4, 8]$

Function? No

3)

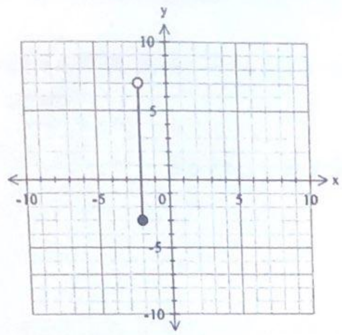


Domain: $[-4, \infty)$

Range: $(-\infty, 9]$

Function? No

4)

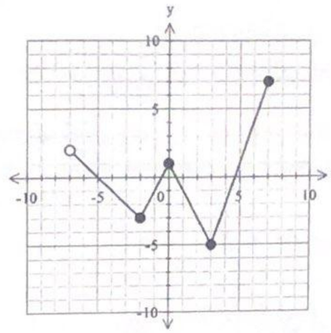


Domain: x = -2

Range: [-3, 7)

Function? No

5)



Domain: (-7, 7]

Range: [-5, 7]

Function? No

Domain and Range (of a function)

Constant Function: f(x) = c

- The domain here is not restricted; x can be anything. When this is the case we say the domain is all real numbers. The outputs are limited to the constant value of the function.
- **Domain:** $(-\infty,\infty)$
- **Range:** [c]
- Since there is only one output value, we list it by itself in square brackets.

Identity Function: f(x) = x

- **Domain:** $(-\infty,\infty)$
- **Range:** $(-\infty,\infty)$

Quadratic Function: f(x) = x^2

- **Domain:** $(-\infty,\infty)$
- **Range:** $[0,\infty)$
- Multiplying a negative or positive number by itself can only yield a positive output.

Cubic Function: f(x) = x^3

- **Domain:** $(-\infty,\infty)$
- **Range:** $(-\infty,\infty)$

Reciprocal: $f(x) = \frac{1}{x}$

- **Domain:** $(-\infty,0) \cup (0,\infty)$
- **Range:** $(-\infty,0) \cup (0,\infty)$

- We cannot divide by 0 so we must exclude 0 from the domain.
- One divide by any value can never be 0, so the range will not include 0.

Reciprocal Squared: $f(x) = \frac{1}{x^2}$

- **Domain:** $(-\infty,0)\cup(0,\infty)$
- **Range:** $(0,\infty)$
- We cannot divide by 0 so we must exclude 0 from the domain.

Cube Root: $f(x) = \sqrt[3]{x}$

- **Domain:** $(-\infty,\infty)$
- **Range:** $(-\infty,\infty)$

Square Root: $f(x) = \sqrt[2]{x}$, commonly just written as, $f(x) = \sqrt{x}$

- **Domain:** $[0,\infty)$
- **Range:** $[0,\infty)$
- When dealing with the set of real numbers we cannot take the square root of a negative number so the domain is limited to 0 or greater.

Absolute Value Function: $f(x) = |x|$

- **Domain:** $(-\infty,\infty)$
- **Range:** $[0,\infty)$
- Since absolute value is defined as a distance from 0, the output can only be greater than or equal to 0.

1.3 Functions and Function Notation

Function Notation - The notation output = f (input) defines a function named f . This would be read "output is f of input"

Ex #1: Use functional notation to evaluate a function with a given input.

Example: Find $f(3)$ if $f(x) = 8x - 1$.

$= 8(3) - 1$

$= 24 - 1$

$f(3) = 23$

1) Find $h(5)$ if $h(x) = -2x^2 + 23$

$-2(5)^2+23$

$-50+23$

$\boxed{-27}$

2) Find $d(-8)$ if $d(x) = \frac{3}{4}x + 6$

$\frac{3}{4}(-8)+6$

$-6+6$

$d(-8)=0$

Ex #2: Use function notation to solve for the input with a given output.

Example: Solve for x if $f(x) = 5x - 3$ and $f(x) = 17$.

$17 = 5x - 3$

$20 = 5x$

$4 = x$

3) Solve for x if $b(x) = -2x - 3$ and $b(x) = 6$.

$-2x-3=6$

$-2x=9$

$x=-\frac{9}{2}$

4) Solve for x if $p(x) = \frac{1}{4}x - 8$ and $p(x) = -2$

$\frac{1}{4}x-8=-2$

$\frac{1}{4}x=6$

$x=24$

Ex #3: Use functional notation to perform operations on functions.

Examples: If $f(x) = 6x + 18$, $g(x) = 9x - 1$, and $h(x) = 3$, then find the following.

a) Find $f(x) - g(x) + h(x)$

$6x+18-(9x-1)+3$

$6x+18-9x+1+3$

$-3x+22$

b) $f(x) - g(x)$

$6x+18-(9x-1)$

$6x+18-9x+1$

$-3x+19$

c) The product of $f(x)$ and $g(x)$

$(6x+18)(9x-1)$

$54x^2-6x+162x-18$

$54x^2+156x-18$

d) $\frac{f(x)}{h(x)}$

$\frac{6x+18}{3}=2x+6$

Functions

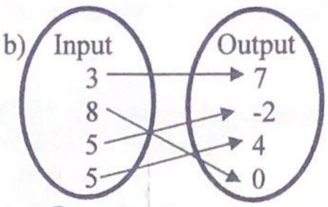
Example 1: Determine if each of the following is a function. Then find the domain and range for each set of ordered pairs below.

a)

x	1	2	3	4	5
y	11	12	13	13	13

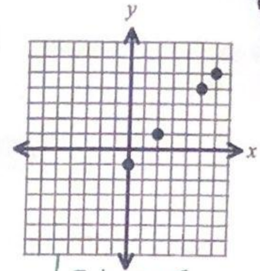
Function: Y
D: x = 1, 2, 3, 4, 5
R: y = 11, 12, 13,

b)



F: Yes
D: x = 3, 8, 5
R: y = 7, -2, 4, 0

c)



F: Yes
D: x = 0, 2, 5, 6
R: y = -1, 1, 4, 5

d) $\{(7,-1),(6,5),(-3,2),(0,5)\}$

F: Yes
D: x = 7, 6, -3, 0
R: y = -1, 5, 2,

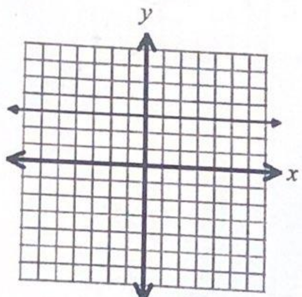
e)

3	Red
7	Blue
~~2~~ -4	Green
5	Green
-4	Green

F: No
D: N/A
R:

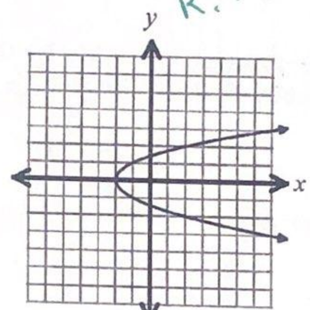
~~F: Yes~~
~~D: 3, 7, -2, 5, -4~~
~~R: Red, Blue, Green~~

f)



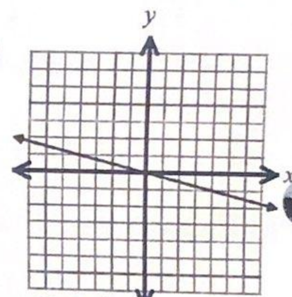
F: Yes
D: $(-\infty,\infty)$
R: y = 3

g)



F: No
D: N/A
R: N/A

h)



F: Yes
D: $(-\infty,\infty)$
R: $(-\infty,\infty)$

Key Vocabulary

Relation

A set of order pairs

Function

Your input goes to only one output.

Vertical Line Test

A relation is a function if, for any Vert. Line drawn it only touches the relation at most 1 time.

Example 3: Terry goes to the carnival, and the amount of money he spends can be modeled by a function in terms of how many rides he purchases. Each ride costs $2.

- Which of the following best models the domain of this function (# of rides)?
  A) 0, 1, 2, 3, …
  B) all real numbers
  C) 1, 2, 3, …
  D) 0, 2, 4, 6, …
- Which of the following best models the range of this function ($ spent)?
  A) 0, 1, 2, 3, …
  B) all real numbers
  C) 1, 2, 3, …
  D) 0, 2, 4, 6, …

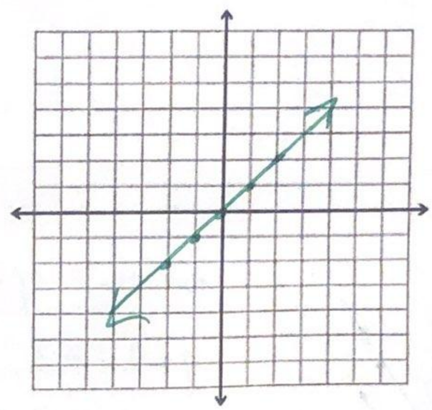
1.4 Graphing Linear Functions

Objectives:

- **Students will graph lines in $y = mx + b$ form.**
- **Students will graph horizontal and vertical lines.**
- **Students will recognize parallel and perpendicular lines.**

Linear Parent Function: $y = x$

x	y	(x, y)
−2	−2	(−2, −2)
−1	−1	(−1, −1)
0	0	(0, 0)
1	1	(1, 1)
2	2	(2, 2)



(Use set notation)

Domain: $(-\infty, \infty)$

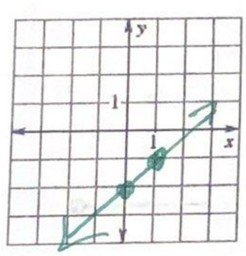
Range: $(-\infty, \infty)$

Slope: $m = 1$

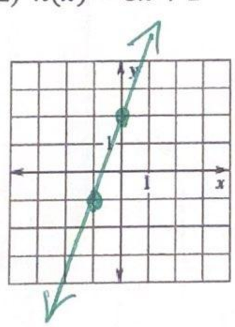
y-intercept: $(0, 0)$

For #1-5, graph the line. State the domain and range in set notation.

1) $y = x - 2$



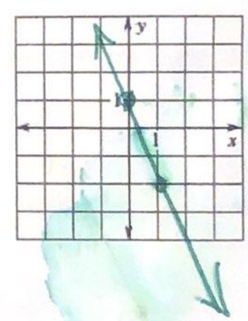
2) $h(x) = 3x + 2$



3) $-2y = 6x - 2$

$\frac{-2y}{-2} = \frac{6x}{-2} - \frac{2}{-2}$

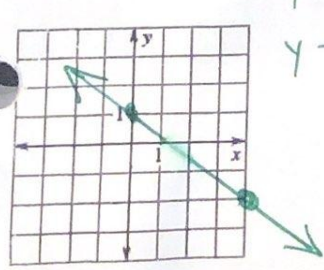
$y = -3x + 1$



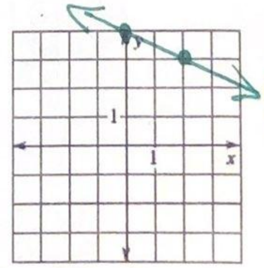
4) $3x + 4y = 4$

$\frac{4y}{4} = \frac{-3x}{4} + \frac{4}{4}$

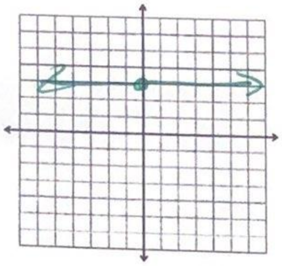
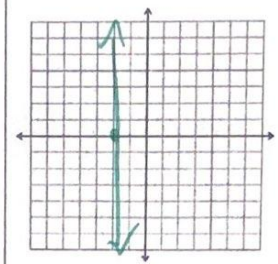
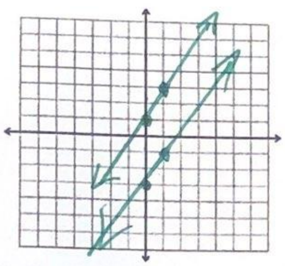
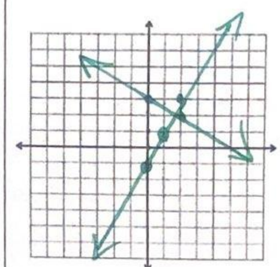
$y = -\frac{3}{4}x + 1$



5) $y = -\frac{1}{2}x + 4$



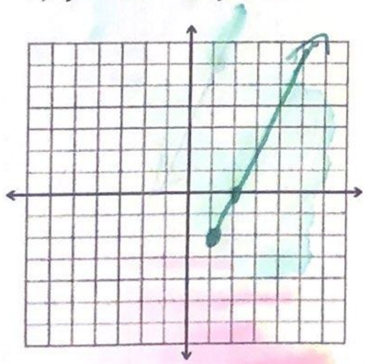
the axis the line "cuts" through

Special Lines	
Horizontal Lines	Vertical Lines
 $y=3$	 $x=-2$
Parallel Lines	Perpendicular Lines
 same slopes $y=2x-3$ $y=2x+1$	 Opposite reciprocal slopes $y=2x-1$ $y=-\frac{1}{2}x+3$

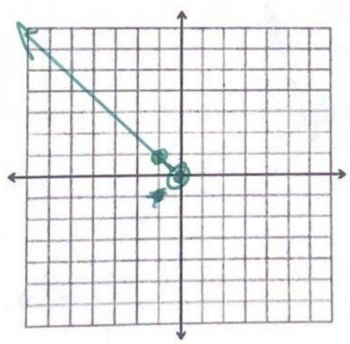
Graphing lines over a restricted domain

For #6-10, graph the line over the given domain.

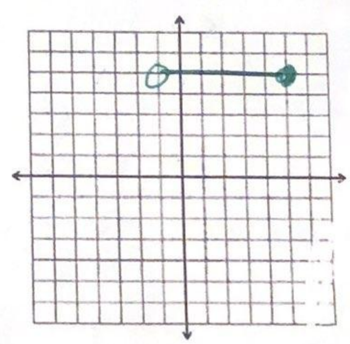
6) $y = 2x - 4\ if\ x \geq 1$



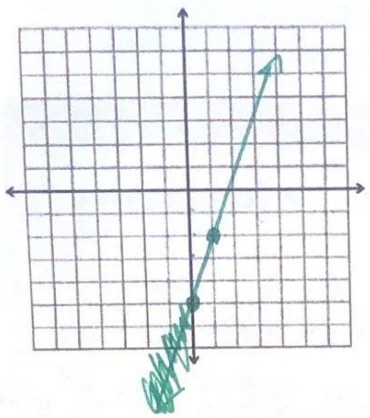
7) $y = -x\ if\ x < 0$



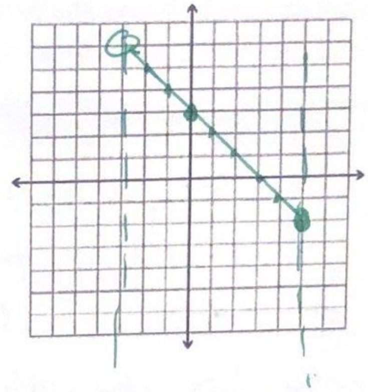
8) $y = 5\ if -1 < x \leq 5$



9) $y = 3x - 5\ if\ x \geq 0$



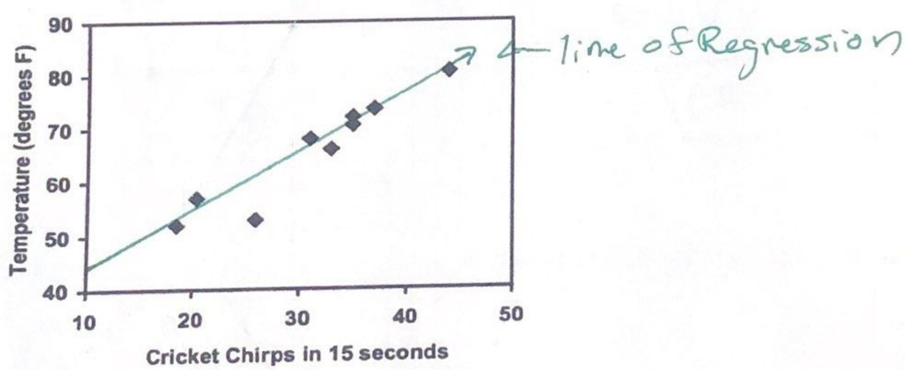
10) $y = -x + 3\ if\ -3 < x \leq 5$



Line of Regression

11) The table below shows the number of cricket chirps in 15 seconds, and the air temperature, in degrees Fahrenheit (Selected data from classic.globe.gov/fsl/scientistsblog/2007/10/. Retrieved Aug 3, 2010). Plot this data, and determine whether the data appears to be linearly related.

chirps	44	35	20.4	33	31	35	18.5	37	26
Temp	80.5	70.5	57	66	68	72	52	73.5	53



1.5: Solving Systems of Linear Equations

Objectives:

- **Students will choose the best method to solve systems.**
- **Students will graph the solutions to systems of inequalities.**

Three methods for solving systems of linear equations:	
Graphing	- Graph both lines and the intersecting point is your solution
Elimination	- Cancel out 1 of the 2 variables, solve for the other. Plug back in to solve for 1st variable
Substitution	- Plug 1 function into the other. Solve for 1 of the variables, plug back in to solve for other

1) Solve each system by graphing and by using elimination.

a) $\begin{cases} 4x + 2y = 4 \\ x - 2y = 6 \end{cases}$

$5x = 10$

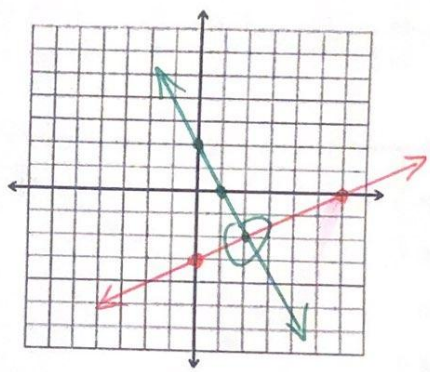
$x = 2$

$2 - 2y = 6$

$-2y = 4$

$y = -2$

$\boxed{(2, -2)}$



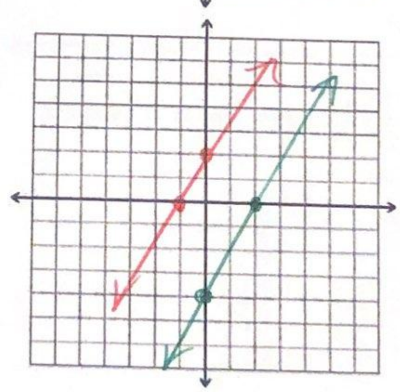
b) $\begin{cases} 6x - 3y = 12 \\ 6x + 3y = -6 \end{cases}$ $\cdot -1$

$0 + 0 = 18$

$0 = 18$

$\boxed{NS}$

// lines, same slope



2) Solve the system by using substitution.

$$\begin{cases} x = -2y - 2 \\ 3x + 4y = 6 \end{cases}$$

$3(-2y-2)+4y=6$

$-6y-6+4y=6$

$-2y=12$

$y=-6$

$x=-2(-6)-2$

$x=12-2$

$x=10$

$\boxed{(10,-6)}$

3) Solve the system by graphing and by method of choice (elimination or substitution).

$$\begin{cases} 3x - 2y = -7 \cdot 3 \\ 2x + 3y = 17 \cdot 2 \end{cases}$$

$-2y=-3x-7$

$y=\frac{3}{2}x+\frac{7}{2}$

$3y=-2x+17$

$y=-\frac{2}{3}x+\frac{17}{3}$

$9x-6y=-21$

$4x+6y=34$

$13x=13$

$x=1$

Plug in $x=1$

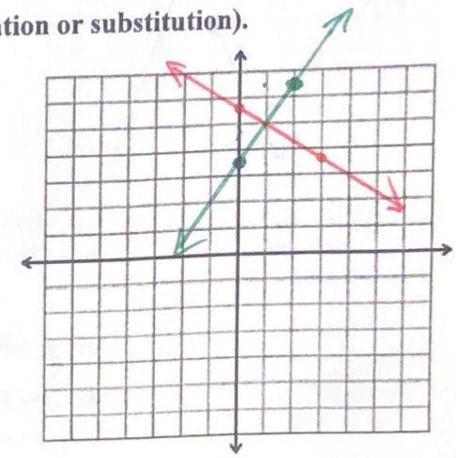
$2(1)+3y=17$

$2+3y=17$

$3y=15$

$y=5$

$\boxed{(1,5)}$



4) Solve the system by graphing and by method of choice (elimination or substitution).

$$\begin{cases} 12x - 3y = 6 \\ -y + 4x = 2 \end{cases}$$

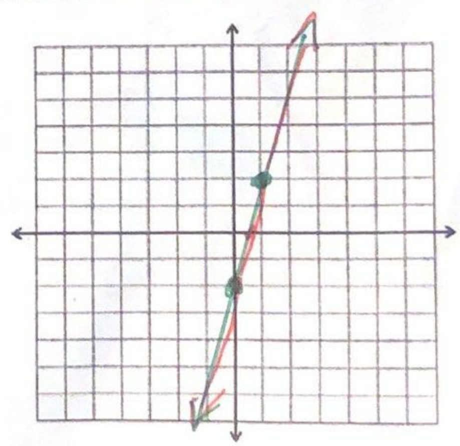
x	y
$\frac{1}{2}$	-2

$y=4x-2$

$12x-3(4x-2)=6$

$12x-12x+6=6$

$\boxed{6=6 \quad \text{IMS}}$



$> <$ dashed line

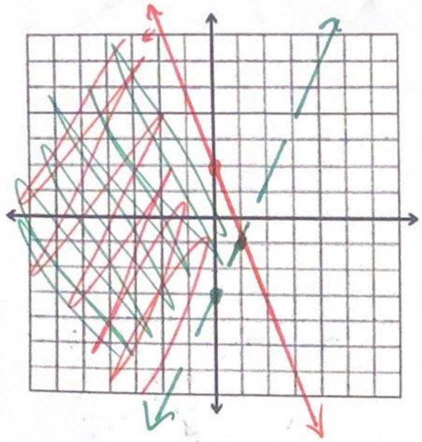
$\geq \leq$ solid line

For #5-6, solve the system of inequalities.

5) $0 > -3$

$$\begin{cases} y > 2x - 3 \\ y \leq -3x + 2 \end{cases}$$

$0 \leq 2$



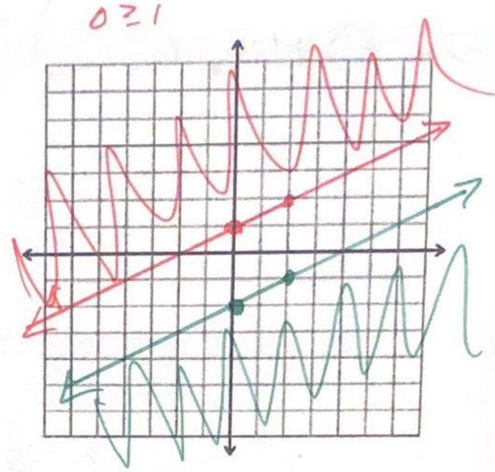
6) $0 \geq 8$

$$\begin{cases} 2x - 4y \geq 8 \\ y \geq \frac{1}{2}x + 1 \end{cases}$$

$0 \geq 1$

$\frac{-4y}{-4} \geq \frac{-2x}{-4} + \frac{8}{-4}$

$y \leq \frac{1x}{2} - 2$



NS

7) At an ice cream shop, one customer pays \$7 for 2 sundaes and 2 milkshakes. A second customer pays \$11 for 2 sundaes and 4 milkshakes. How much does one sundae cost? How much does one milkshake cost?

x y

$2x + 2y = 7$

$-2x - 4y = -11 \quad \cdot -1$

$-2y = -4$

$y = 2$

$2x + 2(2) = 7$

$2x + 4 = 7$

$2x = 3$

$x = \frac{3}{2}$ or \$1.50

Sundaes are \$1.50
Milkshakes are \$2.00

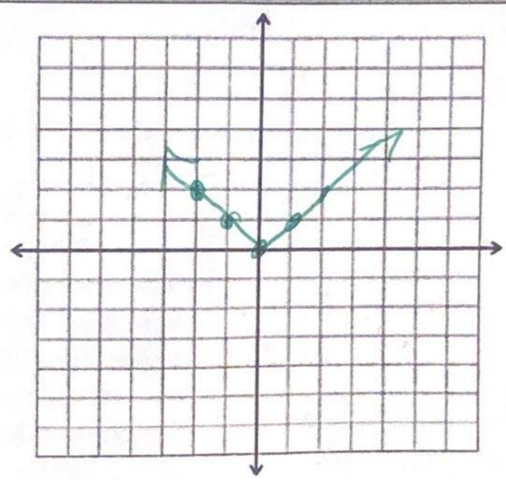
1.6 Notes: Parent Functions, Transformations (Linear and Absolute Value)

Objectives:

- **Students will know the graph shape of linear and absolute value equations.**
- **Students will graph functions by moving parent functions.**

Absolute Value Parent Function: $y = |x|$

x	y	(x, y)
−2	2	(−2, 2)
−1	1	(−1, 1)
0	0	(0, 0)
1	1	(1, 1)
2	2	(2, 2)



Set notation $\{x \mid x \text{ is } \mathbb{R}\}$ $\{y \mid y \text{ is } \mathbb{R}\}$

Domain: ~~$(-\infty, \infty)$~~ **Range:** [illegible]

Interval notation

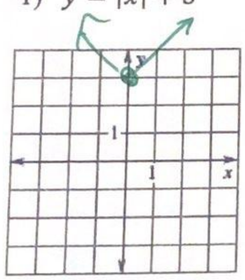
Domain: $(-\infty, \infty)$ **Range:** $[0, \infty)$

Vertex: $(0, 0)$

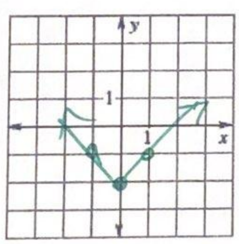
Axis of Symmetry: $x = 0$

Explore #1-7: Graph the absolute value function in a graphing calculator. State how the graph is transformed from the parent function $y = |x|$.

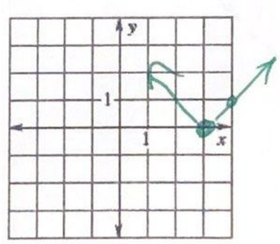
1) $y = |x| + 3$



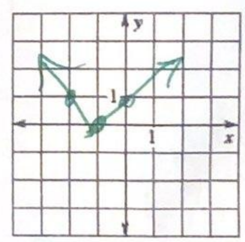
2) $y = |x| - 2$



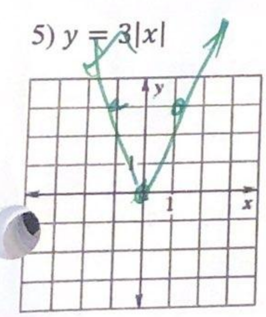
3) $y = |x - 3|$



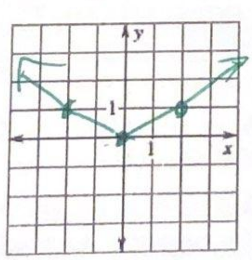
4) $y = |x + 1|$



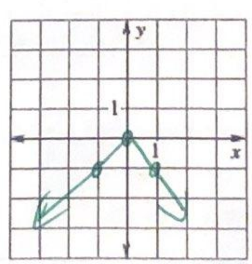
5) $y = 3|x|$



6) $y = \frac{1}{2}|x|$



7) $y = -|x|$



Summarize the **transformations** for an **absolute value function** in vertex form:

$$y = a|x - h| + k$$

a: $|a| > 1$ stretched
$0 < |a| < 1$ compressed

h: opposite h, ← →

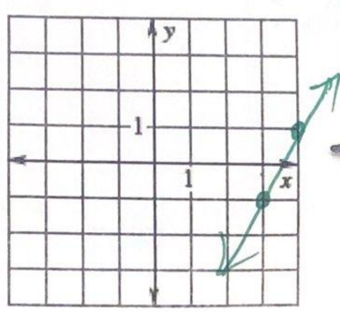
k: Keep k, ↑↓

leading neg: Ref.

Different forms of a linear equation	
Slope intercept form	$y = mx + b$ Where, m is the slope and b is the y-intercept.
(h, k) form	$y = a(x - h) + k$ Where, a is the slope and (h, k) is a point on the line.

For #8-9, graph the linear equation; given in (h, k) form.

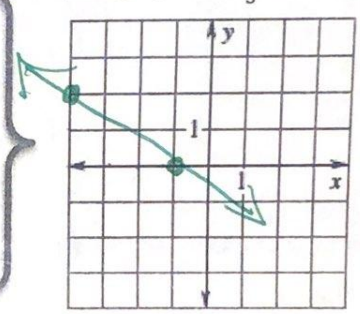
8) Graph $y = 2(x - 3) - 1$ pt $(3, -1)$

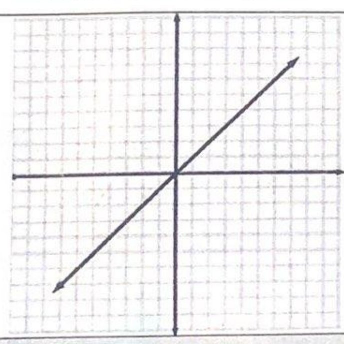
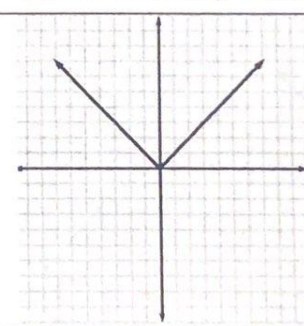


Note!

The transformations that are used for an absolute value function also work to transform a linear function when written in (h, k) form.

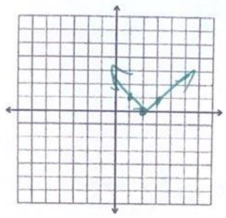
9) Graph $y = -\frac{2}{3}(x + 4) + 2$ pt $(-4, 2)$



Linear Function	Absolute Value Function
Parent Function: $y = x$	*Parent Function:* $y = \|x\|$
	
***(h, k)* Form**	
$y = a(x - h) + k$	$y = a\|x - h\| + k$
Transformations	
Changes the *shape* of the Graph: If $0 < a < 1$, the graph is **compressed** by a factor of a If $a > 1$, the graph is **stretched** by a factor of a If $a < 0$, the graph is **reflected** in the $x - axis$t	**Changes the *position* of the Graph:** If h is positive $(x - h)$, the graph moves **right**. If h is negative $(x + h)$, the graph moves **left**. If k is positive, the graph moves **up**. If k is negative, the graph moves **down**.

For #10-17, Classify each graph as linear or absolute value. Then graph each function *without a graphing calculator* next to the parent function. Describe the transformation, domain, and range in set notation.

10) $y = |x - 2|$



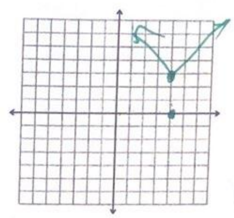
Parent Function: $y = |x|$

Transformations: → 2

Vertex: (2,0)

Domain: $(-\infty,\infty)$ Range: $[0,\infty)$

11) $f(x) = |x - 4| + 3$



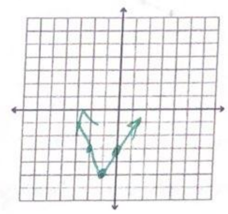
Parent Function: $y = |x|$

Transformations: →4, ↑3

Vertex: (4,3)

Domain: $\mathbb{R}$ Range: $y \geq 3$

12) $g(x) = 2|x + 1| - 5$



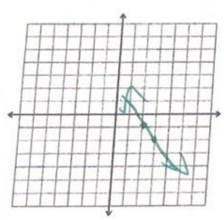
Parent Function: $y = |x|$

Transformations: ←1, ↓5, stretched

Vertex: (-1,-5)

Domain: $\mathbb{R}$ Range: $y \geq -5$

13) $y = -(x - 2) - 1$



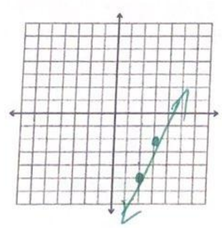
Parent Function: $y = x$

Transformations: Ref, →2, ↓1

Point: (2,-1)

Domain: $\mathbb{R}$ Range: $\mathbb{R}$

14) $y = 3(x - 2) - 5$



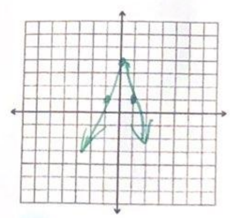
Parent Function: $y = x$

Transformations: →2, ↓5, stretched

Point: (2,-5)

Domain: $\mathbb{R}$ Range: $\mathbb{R}$

15) $h(x) = -3|x| + 4$



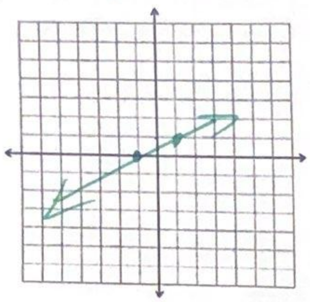
Parent Function: $y = |x|$

Transformations: Ref, stretched, ↑4

Vertex: (0,4)

Domain: $\mathbb{R}$ Range: $y \leq 4$

16) $y = \frac{1}{2}(x+1)$



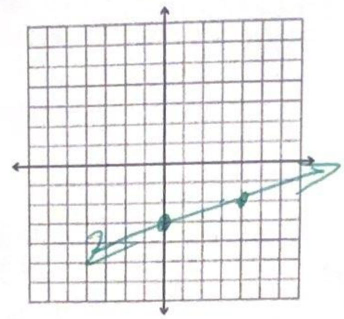
Parent Function: $y = x$

Transformations: $\leftarrow 1$, compressed

Vertex: $(-1, 0)$

Domain: $\mathbb{R}$ Range: $\mathbb{R}$

17) $h(x) = \frac{1}{4}x - 3$



Parent Function: $y = x$

Transformations: $\downarrow 3$, comp.

Vertex: $(0, -3)$

Domain: $\mathbb{R}$ Range: $\mathbb{R}$

18) Students Studying motion observed a cart rolling at a constant rate along a straight line. The table below gives the distance, $f(t)$ feet, the cart was from a reference point at 1-second intervals from $t = 0$ to $t = 5$ seconds.

initial

t	0	1	2	3	4	5
$f(t)$	14	20	26	32	38	44

Which of the following equations represents this relationship between $f(t)$ and t?

~~A.~~ $f(t) = t + 14$

~~B.~~ $f(t) = 6t + 8$

C. $f(t) = 6t + 14$

~~D.~~ $f(t) = 14t + 6$

~~E.~~ $f(t) = 34t$

* Test by plugging in various t values.

1.7 Notes: Solving Absolute Value Functions

Learning Objectives

- **Solve absolute value equations with 2 solutions or no solution algebraically.**

Warm-up:

1) How far is the number 13 from 0? How far is -13 from 0?

13 13

2) $|-5|$ means the "absolute value of -5", which is 5. What is the value of $|5|$?

5

Absolute Value:

- Absolute Value represents the distanct from zero.
- Always comes out to be positive.

Solving Absolute Value Equations:

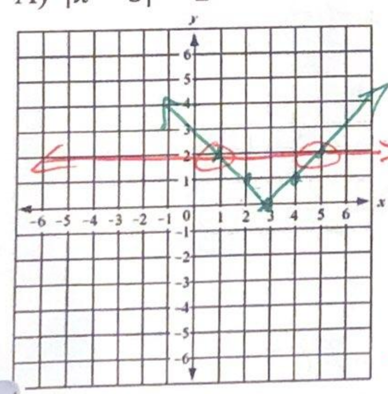
1.) Set 1 equation = without abs. value symbols

2.) Do it again, but make 1 side negative (or opposite)

Explore: Your teacher will graph the following absolute value equations on Desmos. Sketch each graph and solution below.

V:(3,0)

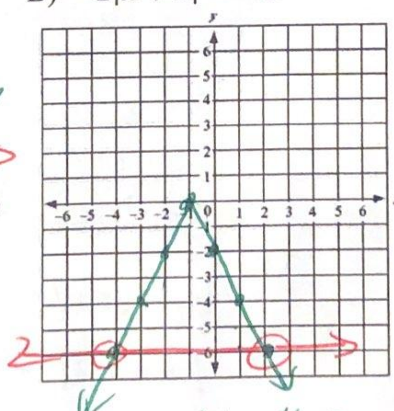
A) $|x-3|=2$



Solution(s): x = 1, 5

V:(-1,0)

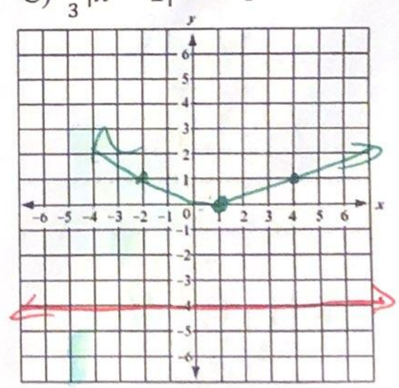
B) $-2|x+1|=-6$



Solution(s): x = -4, 2

V:(1,0)

C) $\frac{1}{3}|x-1|=-4$



Solution(s): NS

Examples 1 – 3: Solve for x in each equation below.

1) $|x| = 6$

$\boxed{x=6, x=-6}$

2) $|4x - 3| = 6$

$4x-3=6$ $\quad$ $4x-3=-6$

$4x=9$ $\quad$ $4x=-3$

$\boxed{x=\frac{9}{4}}$ $\quad$ $\boxed{x=-\frac{3}{4}}$

3) $|x| - 3 = 6$

$|x|=9$

$\boxed{x=9 \quad x=-9}$

Examples 6 – 8: Solve for x in each equation below.

6) $3|x| = 6$

$|x|=2$

$\boxed{x=2 \quad x=-2}$

7) $3|x + 2| = 6$

$|x+2|=2$

$x+2=2$ $\quad$ $x+2=-2$

$\boxed{x=0}$ $\quad$ $\boxed{x=-4}$

8) $3|x| + 2 = 6$

$3|x|=4$

$|x|=\frac{4}{3}$

$\boxed{x=\frac{4}{3}, x=-\frac{4}{3}}$

Absolute Value Equations with No Solution

$-|x| \neq -\#$

Examples 9 – 14: Solve for x, if possible.

9) $|x| + 16 = 10$

$-16 \quad -16$

$|x|=-6$

$\boxed{NP}$

10) $-5|x| - 1 = -11$

$\frac{-5|x|}{-5}=\frac{-10}{-5}$

$|x|=2$

$\boxed{x=2,-2}$

11) $-2|x - 4| = 20$

$\frac{-2|x-4|}{-2}=\frac{20}{-2}$

$|x-4|=-10$

$\boxed{NP}$

12) $-2|-3x + 1| + 6 = -4$

$\frac{-2|-3x+1|}{-2}=\frac{-10}{-2}$

$|-3x+1|=5$

$-3x+1=5$ $\quad$ $-3x+1=-5$

$-3x=4$ $\quad$ $-3x=-6$

$\boxed{x=-\frac{4}{3}}$ $\quad$ $\boxed{x=2}$

13) $2|b + 5| - 8 = -4$

$+8 \quad +8$

$\frac{2|b+5|}{2}=\frac{4}{2}$

$|b+5|=2$

$b+5=2$ $\quad$ $b+5=-2$

$\boxed{b=-3}$ $\quad$ $\boxed{b=-7}$

14) $\frac{1}{3}|5a + 2| + 11 = 2$

$\frac{1}{3}|5a+2|=-9$

$|5a+2|=-27$

$\boxed{NP}$

Example 15: Which of the equations below have no solution? Choose all that apply.

A. $-5|x+6| = 10$

$|x+6| = -2$

$\boxed{NS}$

B. $|x+31| - 8 = -2$

$|x+31| = 6$

$x+31 = 6$ $\quad$ $x+31=-6$

$\boxed{x=-25}$ $\quad$ $\boxed{x=-37}$

C. $\frac{3|2x+1|}{3} = \frac{-12}{3}$

$|2x+1| = -4$

$\boxed{NS}$

D. $-8|x-4| - 6 = 2$

$\frac{-8|x-4|}{-8} = \frac{8}{-8}$

$|x-4| = -1$

$\boxed{NS}$

Solving Absolute Value Inequalities:

16) $\left|\frac{n}{4}\right| \leq 3$

Test		Result
-13	$\frac{-13}{4} \leq 3$	F
0	$0 \leq 3$	T
13	$\frac{13}{4} \leq 3$	F

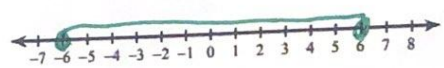
$\frac{n}{4} = 3$ $\quad$ $\frac{n}{4} = -3$

$n = 12$ $\quad$ $n = -12$

17) $|-9v| \leq 54$

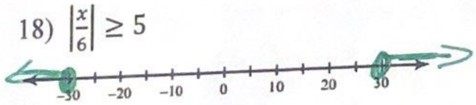
$-9v = 54$ $\quad$ $-9v = -54$

$v = -6$ $\quad$ $v = 6$



Test		Result
-7	$63 \leq 54$	F
0	$0 \leq 54$	T
7	$63 \leq 54$	F

18) $\left|\frac{x}{6}\right| \geq 5$

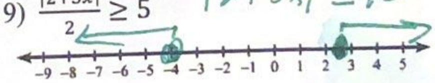


$\frac{x}{6} = 5$ $\quad$ $\frac{x}{6} = -5$

$x = 30$ $\quad$ $x = -30$

test		Res.
-36	$6 \geq 5$	T
0	$0 \geq 5$	F
36	$6 \geq 5$	T

19) $\frac{|2+3x|}{2} \geq 5$ $\quad$ $|2+3x| \geq 10$



$2+3x \geq 10$ $\quad$ $2+3x \leq -10$

$3x \geq 8$ $\quad$ $3x \leq -12$

$x \geq \frac{8}{3} = 2.67$ $\quad$ $x = -4$

Test		Res.
-6	$\frac{\lvert 2+-18 \rvert}{2}, \frac{16}{2}, 8 \geq 5$	True
0	$0 \geq 5$	False
4	$\frac{\lvert 14 \rvert}{2}, \frac{14}{2}, 7 \geq 5$	True

1.8 Notes: Piecewise Functions

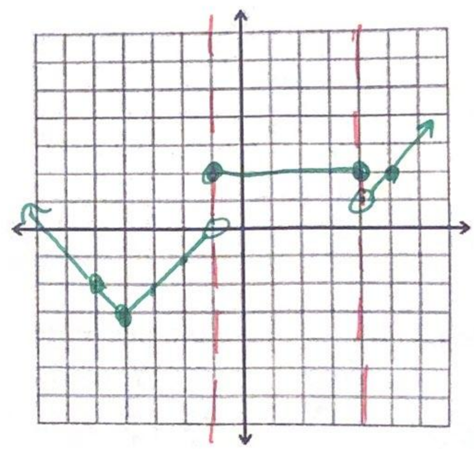
Objectives:

- **Students will graph piecewise functions, given the equations.**
- **Students will write piecewise functions, given the graph.**

Exploration:

Step 1: Graph each of the following functions on the *same* coordinate system. Use a pencil and graph each one lightly. Later you will be erasing at least one piece of each function. Verify your graphs with your teacher before proceeding to Step 2.

$y = x - 3$
$y = 2$
$y = |x + 4| - 3$



Step 2: Suppose that we only want a *piece* of each of the above functions. Use the restrictions listed below for each function to decide which piece to keep. Erase all other portions of each function.

$y = x - 3 \quad if\ x > 4$
$y = 2 \quad if\ -1 \le x \le 4$
$y = |x + 4| - 3 \quad if\ x < -1$

(-4,-3)

Piecewise Function	When we use a *piece* of various different functions (and still pass the vertical line test), the resulting graph is called a Piecewise function.

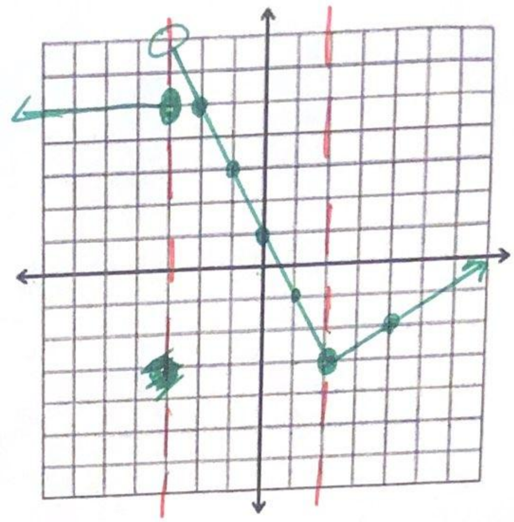
The one you graphed above would be described symbolically as:

$$y = \begin{cases} x - 3 & \text{if } x > 4 \\ 2 & \text{if } -1 \le x \le 4 \\ |x+4| - 3 & \text{if } x < -1 \end{cases}$$

1) **Graph the following piecewise function.**

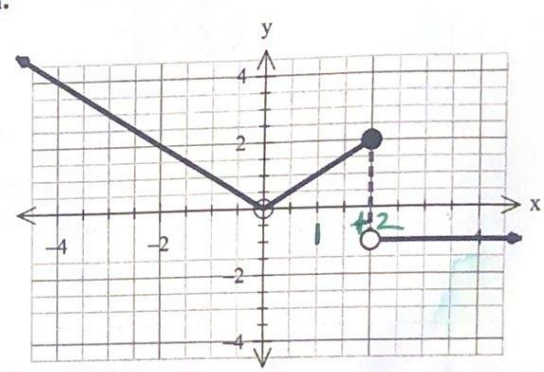
$$f(x) = \begin{cases} 5 & \text{if } x \le -3 \\ -2x + 1 & \text{if } -3 < x \le 2 \\ \frac{1}{2}|x| - 4 & \text{if } x > 2 \end{cases}$$

(0, -4)



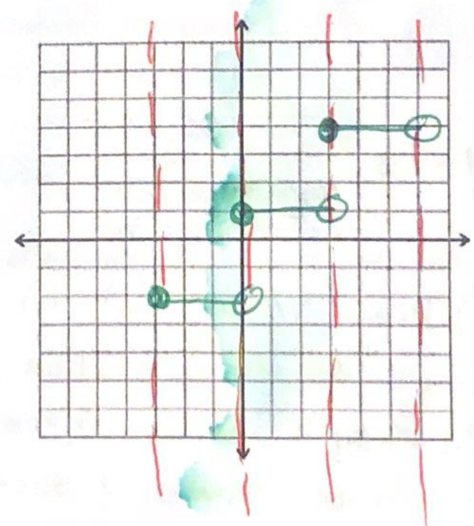
2) **Write the piecewise function that describes the graph.**

$$y = \begin{cases} |x| & \text{if } x \le 2 \\ -1 & \text{if } x > 2 \end{cases}$$



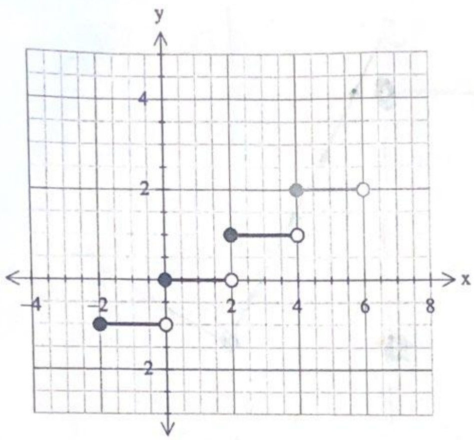
3) **Graph the piecewise function provided below.**

$$y = \begin{cases} -2 & if -3 \le x < 0 \\ 1 & if\ 0 \le x < 3 \\ 4 & if\ 3 \le x < 6 \end{cases}$$



- This type of piecewise function is often called a step function. Why do you think this is so?

4) **Write the piecewise function that describes the graph shown.**



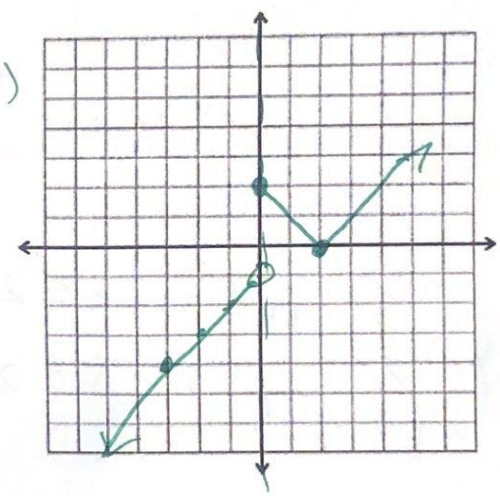
$$y = \begin{cases} -1 & \text{if } -2 \le x < 0 \\ 0 & \text{if } 0 \le x < 2 \\ 1 & \text{if } 2 \le x < 4 \\ 2 & \text{if } 4 \le x < 6 \end{cases}$$

5) **Graph the piecewise function given below.**

$$g(x) = \begin{cases} (x+3) - 4 & \text{if } x < 0 \\ |x-2| & \text{if } x \ge 0 \end{cases}$$

$(-3, -4)$

$(2, 0)$



6) You have a summer job that pays time and a half for overtime (if you work more than 40 hours). After that it is 1.5 times your hourly rate of \$7.00/hr.

a) Write a piecewise function that represents the problem.

$$y = \begin{cases} 7x & 0 \le x \le 40 \\ 7x + 10.50(x-40) & > 40 \end{cases}$$

$280 + 10.50(x-40)$ if $x > 40$

b) How much money do you make if you work 45 hours?

$280 + 10.50(45-40)$

$280 + 52.50$

$= \$332.50$

Reflection: Describe in your own words how to graph piecewise functions.

1.) Draw VA (restriction)

2.) Decide which section each graph should be in.

3.) Graph function normally.

4.) Erase unwanted sections.