Day	Date	Assignment (Due the next class meeting)
Monday Tuesday	8/14/23 (A) 8/15/23 (B)	WELCOME BACK! Syllabus & Class Expectations
Wednesday Thursday	8/16/23 (A) 8/17/23 (B)	**1.1 Worksheet (Solving Equations)** **Get syllabus signed!** **Pay Lab Fee $3.00**
Friday Monday	8/18/23 (A) 8/21/23 (B)	**1.2 Worksheet (Domain and Range)** *Have you paid your lab fee?* *Have you returned your signed syllabus?*
Tuesday Wednesday	8/22/23 (A) 8/23/23 (B)	**1.3 Worksheet (Graphing Lines)**
Thursday Friday	8/24/23 (A) 8/25/23 (B)	**1.4 Worksheet (Solving Linear Systems)**
Monday Tuesday	8/28/23 (A) 8/29/23 (B)	**1.5 Worksheet (Parent Functions and Transformations)**
Wednesday Thursday	8/30/23 (A) 8/31/23 (B)	**1.6 Worksheet (Piecewise Functions)**
Friday Tuesday	9/1/23 (A) 9/5/23 (B)	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.**
Wednesday Thursday	9/6/23 (A) 9/7/23 (B)	**Unit 1 Test**

- Be prepared for daily quizzes.
- Every student is expected to do every assignment for the entire unit.
- Students who complete *every assignment* for this semester are eligible for a 2% semester grade bonus. If a student has no late assignments they will also receive a pizza lunch paid for by the math department.
- Try www.khanacademy.org or www.mathguy.us (Earl's website) if you need help.

Ch. 1 Essential Understanding: Can you solve equations and analyze the graphs of basic functions and their transformations?

1.1 Notes: Solving Equations

Objectives:

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

Remember when? For #1-10, work with your group or a partner to solve each of the following equations. If needed, write your *answer as a simplified fraction*. No decimals!

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

$7x + 15 = -14$
$-15 \quad -15$

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

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

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

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

$-10a + 3 = 15$
$-3 \quad -3$

$\frac{-10a}{-10} = \frac{12}{-10}$

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

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

$4y + 11 = 13y - 10 - 6y$

$4y + 11 = 7y - 10$
$-4y + 10 \quad -4y + 10$

$\frac{21}{3} = \frac{3y}{3}$

$\boxed{y = 7}$

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

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

$x = \frac{80}{5} = \boxed{16}$

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

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

$7x + 1 = 33$
$-1 \quad -1$

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

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

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

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

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

$\frac{-14}{2} = \frac{2x}{2}$

$\boxed{x = -7}$

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

$y + 3 = -x + 4$
$-3 \quad -3$

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

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

$\sqrt{b^2} = \sqrt{4}$

$\boxed{b = \pm 2}$

10) $3h^2 - 10 = 17$
$+10 \quad +10$

$\frac{3h^2}{3} = \frac{27}{3}$

$\sqrt{h^2} = \sqrt{9}$

$\boxed{h = \pm 3}$

* Don't forget the $\pm$

When you are ***solving an equation***, what are you trying to do?	You are trying to solve for the variable. You are making one side = to the other.
What happens when you are ***solving an Inequality***?	You are finding the range, or ranges, of values that an unknown x can take & still satisfy the inequality

For #11 – 12, solve each inequality.

11) $2x + 5 < 19$

$-5 \quad -5$

$\frac{2x}{2} < \frac{14}{2}$

$x < 7$

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

$-4 \quad -4$

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

$x \leq -8$

Preview: Factoring Trinomials. FOIL

13. a) Multiply: $(x + 1)(x - 4)$

F L I O

$x^2 - 4x + 1x - 4$

$x^2 - 3x - 4$

b) Factor: $x^2 - 3x - 4$

F OI L

$(x+1)(x-4)$

O

14. a) Multiply: $(x + 5)(x + 6)$

$x^2 + 6x + 5x + 30$

$x^2 + 11x + 30$

b) Factor: $x^2 + 11x + 30$

$(x+5)(x+6)$

5x

6x

15. a) Multiply: $(x + 6)(x - 7)$

$x^2 - 7x + 6x - 42$

$x^2 - x - 42$

b) Factor: $x^2 - x - 42$

$(x+6)(x-7)$

+6x

−7x

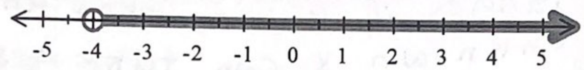
1.2 Notes: Domain and Range

Objectives:

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

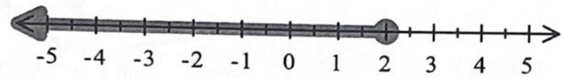
Exploration: **With a partner, try to describe the shaded portion of each number line any way you can.**

a)



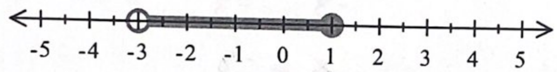
$x > -4$ $\{x \mid x > -4\}$ or $(-4, \infty)$

b)



$x \leq 2$ $\{x \mid x \leq 2\}$ or $(-\infty, 2]$

c)



$-3 < x \leq 1$ $\{x \mid -3 < x \leq 1\}$ $(-3, 1]$

There are *two different* ways to describe an interval.	
Set Notation	$\{x \mid x > 0\}$ the set of / all x / such that / x is greater than 0
Interval Notation	$(-3, 1]$ *Note use ( ) for ○, > < use [ ] for ●, ≥ ≤

With your teacher, go back to exploration problems a-c and describe the shaded intervals in both set notation and interval notation.

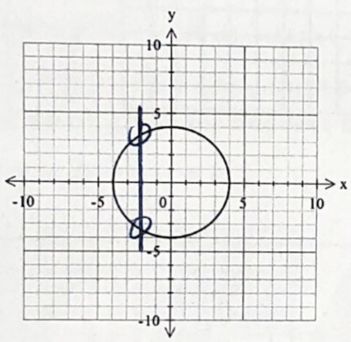
Algebra 2 **Chapter 1 Notes** **DRHS**

Domain and Range

The ***domain*** of a function	the "input" values for which the function is defined $y = 4x + 3$ (input $x = 3$) or (the x-values)
The ***range*** of a function	the "output" values for which the function is defined $y = 4x + 3$ ($x = 3$, output $y = 15$) or (the 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)

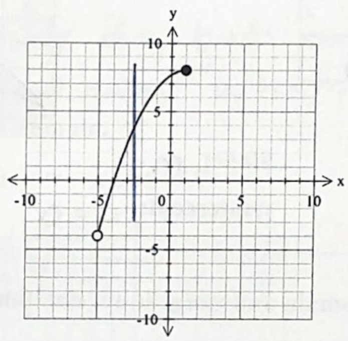


Domain: [-4, 4]

Range: [-4, 4]

Function? no

2)

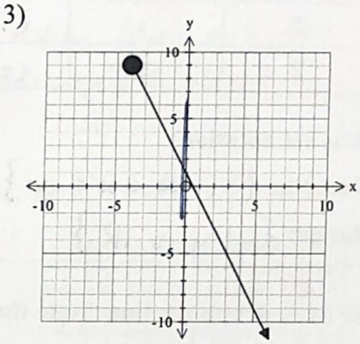


Domain: (-5, 1]

Range: (-4, 8]

Function? yes

3)

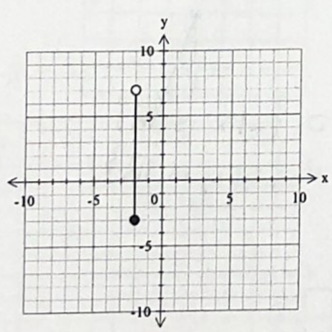


Domain: [-4, ∞)

Range: (-∞, 9]

Function? yes

4)

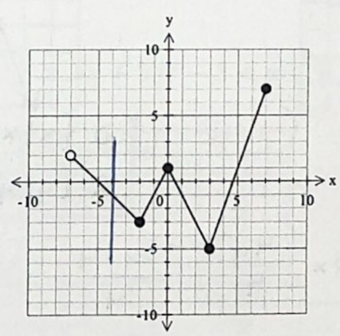


Domain: $x = -2$

Range: [-3, 7)

Function? no

5)



Domain: (-7, 7]

Range: [-5, 7]

Function? yes

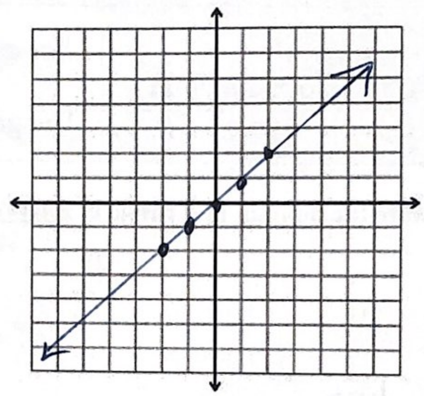
1.3 Graphing Linear Functions

Objectives:

- **Students will graph lines in $y = mx + b$ form.**
- **Students will graph horizontal and vertical 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: $\{x \mid -\infty < x < \infty\}$

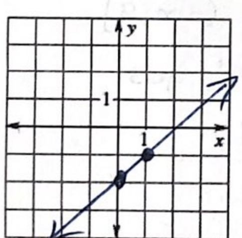
Range: $\{y \mid y \text{ is } \mathbb{R}\}$

Slope: $m = 1$

y-intercept: $y = 0$

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

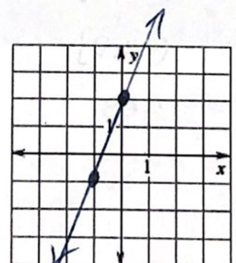
1) $y = x - 2$



D: $\{x \mid x \text{ is } \mathbb{R}\}$

R: $\{y \mid y \text{ is } \mathbb{R}\}$

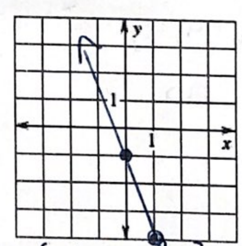
2) $h(x) = 3x + 2$



D: $\{x \mid x \text{ is } \mathbb{R}\}$

R: $\{y \mid y \text{ is } \mathbb{R}\}$

3) $\frac{-2y}{-2} = \frac{6x - 2}{-2}$ $y = -3x - 1$



D: $\{x \mid x \text{ is } \mathbb{R}\}$

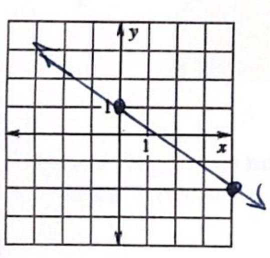
R: $\{y \mid y \text{ is } \mathbb{R}\}$

4) $3x + 4y = 4$

$-3x \quad -3x$

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

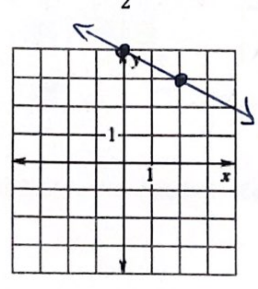
$y = -\frac{3}{4}x + 1$



D: $\{x \mid x \text{ is } \mathbb{R}\}$

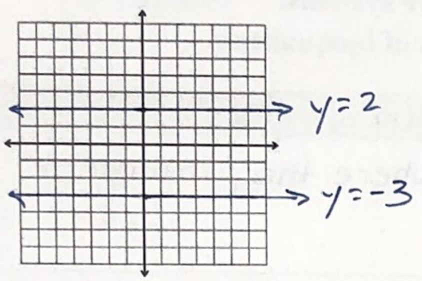
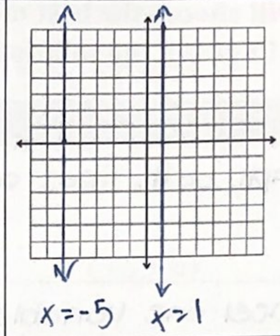
R: $\{y \mid y \text{ is } \mathbb{R}\}$

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



D: $\{x \mid x \text{ is } \mathbb{R}\}$

R: $\{y \mid y \text{ is } \mathbb{R}\}$

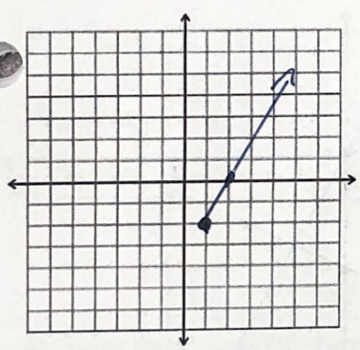
Special Lines	
Horizontal Lines	Vertical Lines
	

Graphing lines over a restricted domain

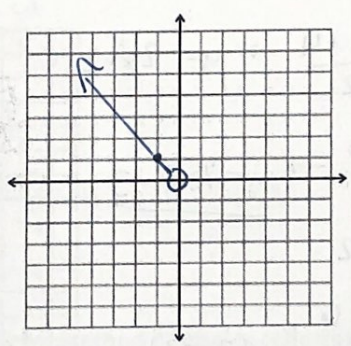
Graph like you normally do, but "cut" the line at the restriction and "throw away" what you don't want

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

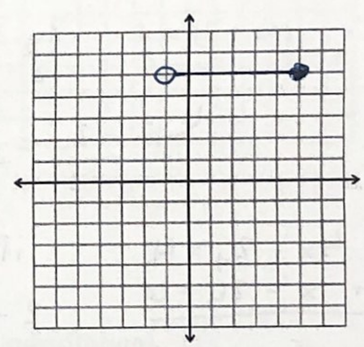
6) $y = 2x - 4 \; if \; x \geq 1$



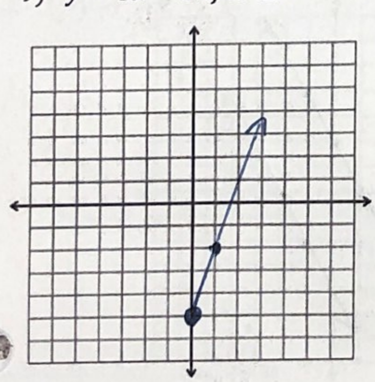
7) $y = -x \; if \; x < 0$



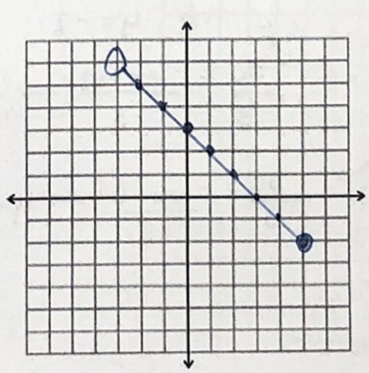
8) $y = 5 \; if \; -1 < x \leq 5$



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



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



1.4: Solving Systems of Linear Equations

Objectives:

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

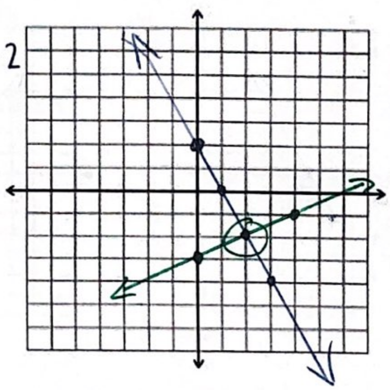
Three methods for solving systems of linear equations:	
Graphing	graph both lines and see where they intersect
Elimination	cancel one variable out and solve for the remaining variable
Substitution	plug one equation into another

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

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

$\frac{2y}{2} = \frac{-4x + 4}{2} \rightarrow y = -2x + 2$

$\frac{-2y}{-2} = \frac{-x + 6}{-2} \rightarrow y = \frac{1}{2}x - 3$



$4x + 2y = 4$
$+\ x - 2y = 6$
$\frac{5x}{5} = \frac{10}{5}$
$x = 2$

if $x = 2$

$2 - 2y = 6$

$\frac{-2y}{-2} = \frac{4}{-2}$

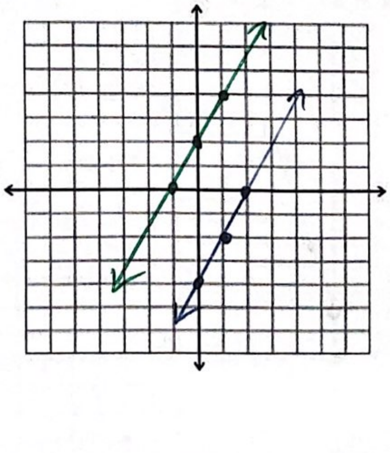
$y = -2$

$(2, -2)$

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

$\frac{-3y}{-3} = \frac{-6x + 12}{-3} \rightarrow y = 2x - 4$

$\frac{-3y}{-3} = \frac{-6x - 6}{-3} \rightarrow y = 2x + 2$



$6x - 3y = 12$
$+\ -6x + 3y = 6$
$0 = 18$

no solution

2) Solve the system by using substitution.

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

plug in

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

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

$-2y + 6 = 6$

$+6 \quad +6$

$-2y = 12 \qquad y = -6$

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

$x = 12 - 2$

$x = 10$

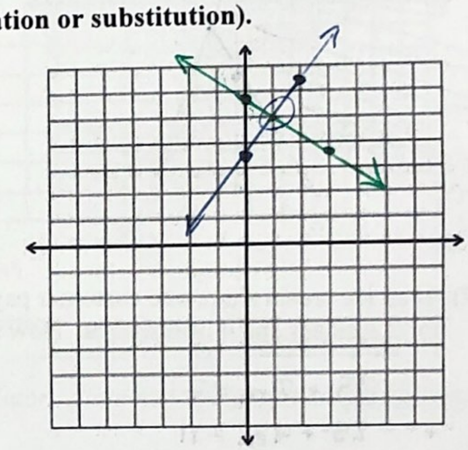
$(10, -6)$

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

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

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

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



$3x - 2y = -7 \quad \cdot 3$

$2x + 3y = 17 \quad \cdot 2$

$9x - 6y = -21$

$+\ 4x + 6y = 34$

$13x = 13$

$x = 1$

if $x = 1$

$y = \frac{3}{2}(1) + \frac{7}{2}$

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

$y = \frac{10}{2}$

$y = 5$

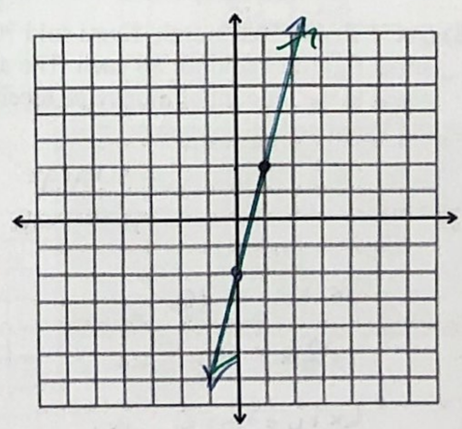
$(1,5)$

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

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

$\rightarrow \frac{-3y}{-3} = \frac{-12x+6}{-3} \rightarrow y = 4x - 2$

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



$12x - 3y = 6$

$4x - y = 2 \quad \cdot 3$

$12x - 3y = 6$

$-12x + 3y = -6$

$0 = 0$

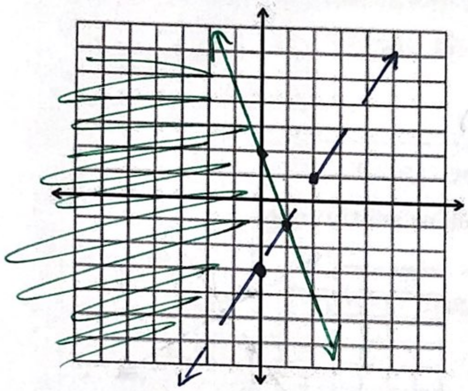
Infinite Many Solutions (IMS)

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

5) $\begin{cases} y > 2x - 3 \leftarrow \\ y \le -3x + 2 \leftarrow \end{cases}$

test (0,0)
$0 > -3$ T

test (0,0)
$0 \le 2$ T

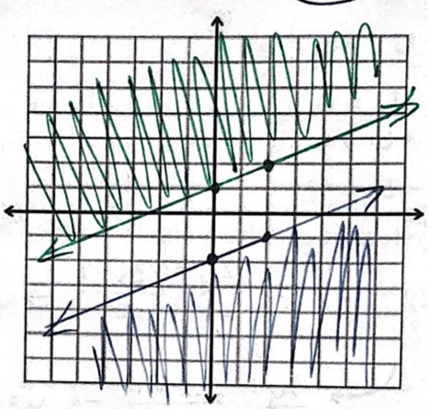


6) $\begin{cases} 2x - 4y \ge 8 \\ y \ge \frac{1}{2}x + 1 \leftarrow \end{cases}$

$-4y \ge -2x + 8$

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

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?

$2s + 2m = 7$
$+ \quad -2s + 4m = 11$
$-2m = -4$
$m = 2$

$2s + 2(2) = 7$
$2s + 4 = 7$
$\frac{2s}{2} = \frac{3}{2}$
$s = \$1.50$

milkshake : $2.00
sundaes : $1.50

8) (ACT Prep) This month, Kami sold 70 figurines in 2 sizes. The large figurines sold for $12 each, and the small figurines sold for $8 each. The amount of money he received from the sales of the large figurines was equal to the amount of money he received from the sales of the small figurines. How many large figurines did Kami sell this month?

x = large
y = small

$x + y = 70$
$12x = 8y$
$(x + y = 70)\,8$
$12x - 8y = 0$

$8x + 8y = 560$
$+ \quad 12x - 8y = 0$
$\frac{20x}{20} = \frac{560}{20}$
$x = 28$

if $x = 28$
$28 + y = 70$
$y = 42$

28 large
42 small

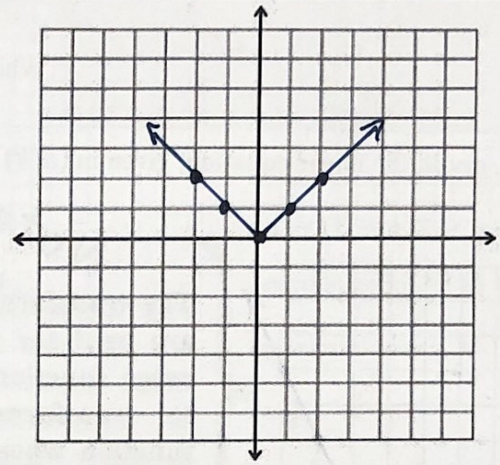
1.5 Notes: Parent Functions, Transformations (Linear and Absolute Value)

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

Domain: $\{x \mid x \text{ is } \mathbb{R}\}$ **Range:** $\{y \mid y \geq 0\}$

Interval notation

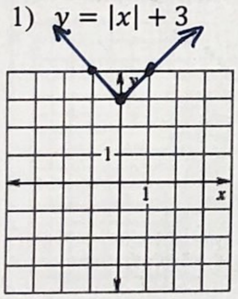
Domain: $(-\infty, \infty)$ **Range:** $[0, \infty)$

Vertex: (0, 0)

Axis of Symmetry: $x = 0$

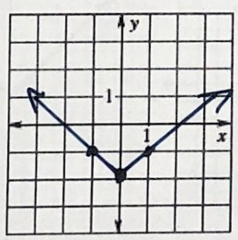
Explore #1-7: Graph the absolute value function in a graphing calculator. State how the graph is <u>*transformed*</u> *from the parent function y = |x|.*

1) $y = |x| + 3$



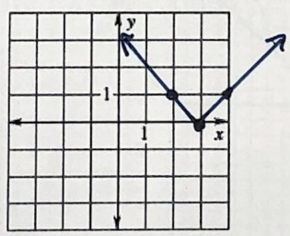
T: ↑3

2) $y = |x| - 2$



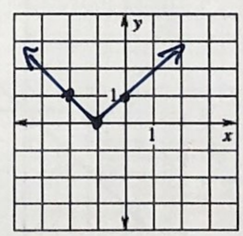
T: ↓2

3) $y = |x - 3|$



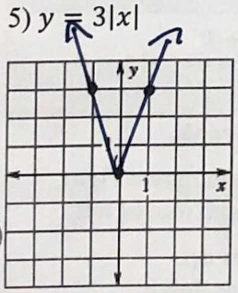
T: → 3

4) $y = |x + 1|$



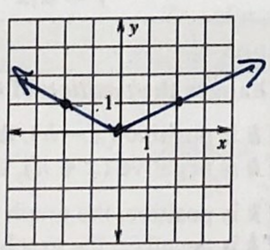
T: ← 1

5) $y = 3|x|$



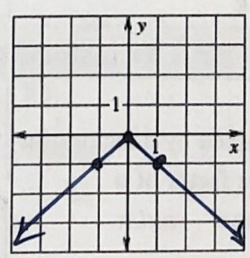
T: stretched by 3

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



T: compressed by $\frac{1}{2}$

7) $y = -|x|$



T: reflected

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

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

a: stretch/compress

h: ← or →

k: ↑ or ↓

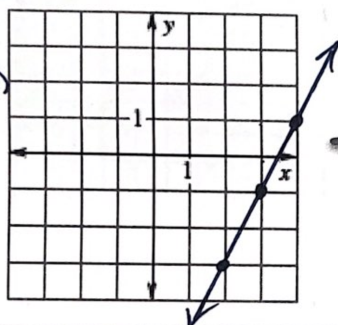
- leading coef: reflected

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 $y = 2(x - 3) - 1$

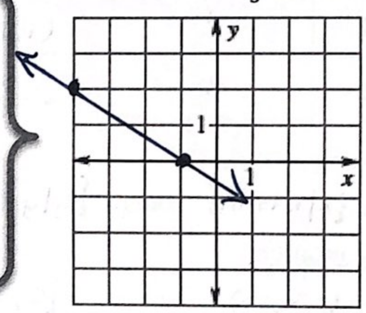
pt: (3,-1)



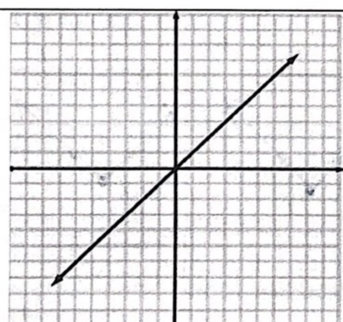
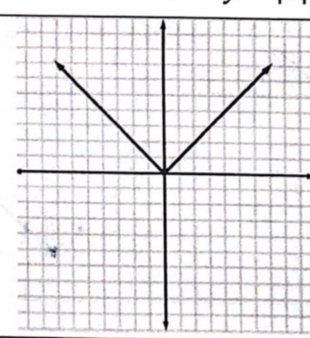
Note!

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

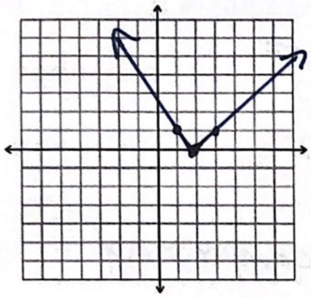


pt: (-4,2)

Linear Function	Absolute Value Function
Parent Function: $y = x$	*Parent Function:* $y = \lvert x \rvert$
	
***(h, k)* Form**	
$y = a(x - h) + k$	$y = a\lvert x - h \rvert + k$
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 $x - axist$	**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) $y = |x - 2|$



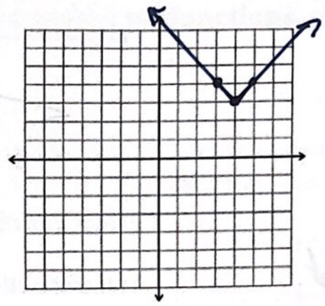
Parent Function: $|x|$

Transformations: → 2

Vertex: (2, 0)

Domain: $\{x \mid x \text{ is } \mathbb{R}\}$ Range: $\{y \mid y \geq 0\}$

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



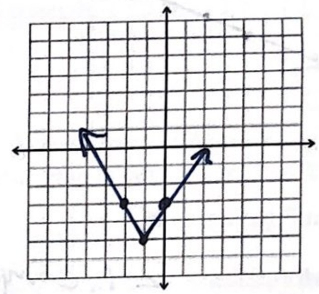
Parent Function: $|x|$

Transformations: → 4, ↑ 3

Vertex: (4, 3)

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

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



Parent Function: $|x|$

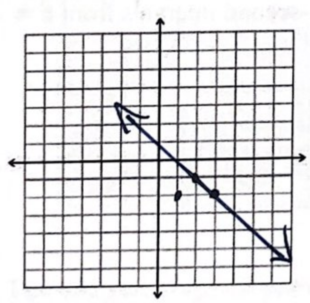
Transformations: ← 1, ↓ 5, stretch by 2

Vertex: (-1, -5)

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

*Be careful

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



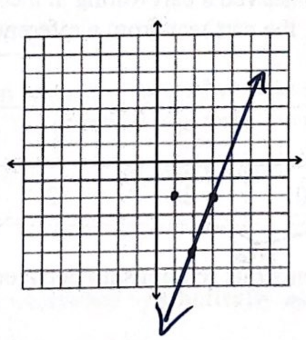
Parent Function: x

Transformations: ref, → 2, ↓ 1

Point: (2, -1)

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

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



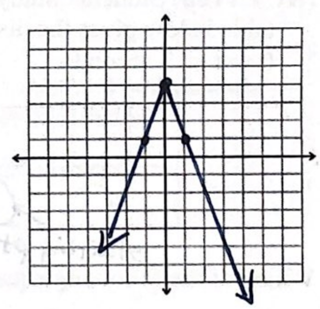
Parent Function: x

Transformations: stretch, → 2, ↓ 5

Point: (2, -5)

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

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



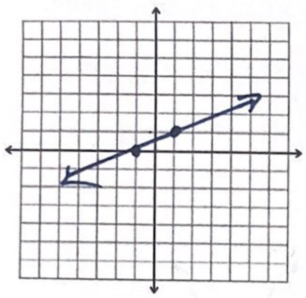
Parent Function: $|x|$

Transformations: ref, stretch, ↑ 4

Vertex: (0, 4)

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

16) $y = \frac{1}{2}(x+1)$ *Be careful 17) $h(x) = \frac{1}{4}x - 3$

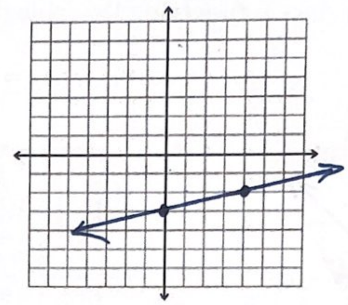


Parent Function: x

Transformations: ← 1, compressed

Vertex: $(-1, 0)$

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



Parent Function: x

Transformations: ↓ 3, compressed

Vertex: $(0, -3)$

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

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

t	0	1	2	3	4	5
d	14	20	26	32	38	44

starting pt. +6 +6

Which of the following equations represents this relationship between d and t?

A. $d = t + 14$

B. $d = 6t + 8$

C. $d = 6t + 14$

D. $d = 14t + 6$

E. $d = 34t$

1.6 Notes: Piecewise Functions

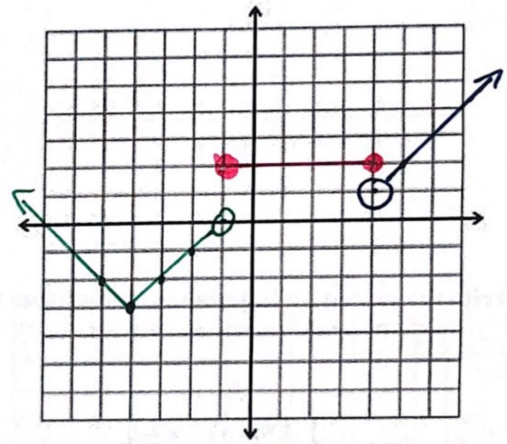
Objectives:

- **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.

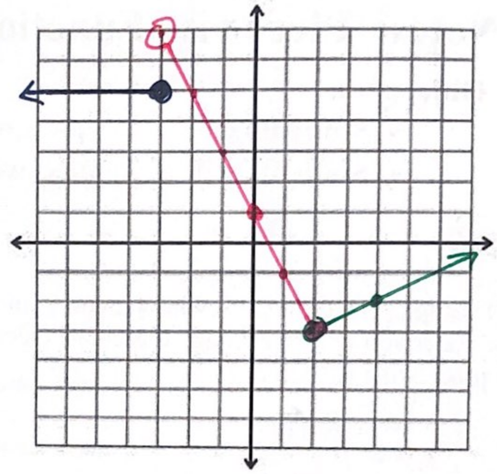
The one you graphed above would be described symbolically as:

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

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

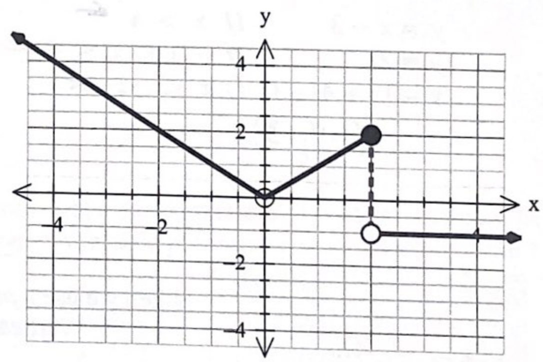
$$f(x) = \begin{cases} 5 & \text{if } x \le -3 \\ -2x+1 & \text{if } -3 < x \le 2 \\ \frac{1}{2}|x| - 4 & \text{if } x > 2 \end{cases}$$

(0, -4)



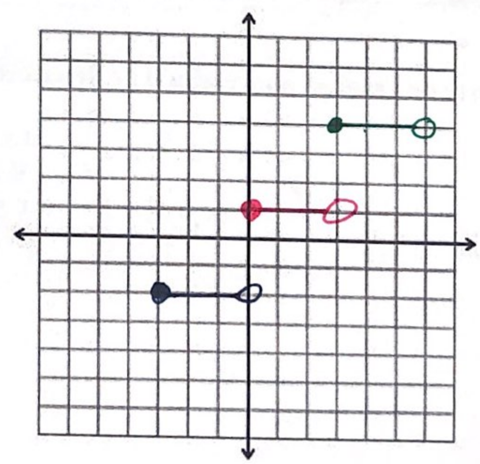
2) **Write the piecewise function that describes the graph.**

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



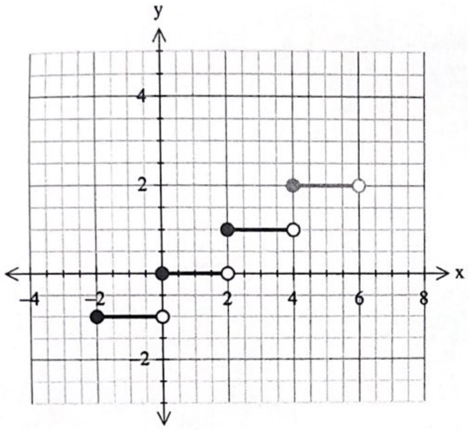
3) **Graph the piecewise function provided below.**

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



- 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.



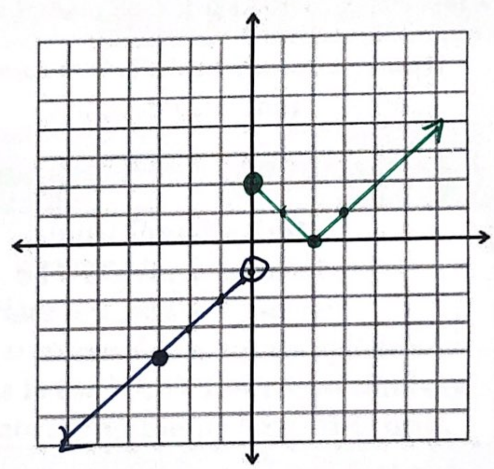
$$f(x) = \begin{cases} -1 \text{ if } -2 \le x < 0 \\ 0 \text{ if } 0 \le x < 2 \\ 1 \text{ if } 2 \le x < 4 \\ 2 \text{ if } 4 \le x < 6 \end{cases}$$

5) Graph the piecewise function given below.

$(-3,-4)$

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

$(2,0)$



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.

$$f(x) = \begin{cases} 7 & 0 < x \le 40 \\ 10.50 & x > 40 \end{cases}$$

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

$7(40) + 5(10.50) =$ \$ 332.56

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