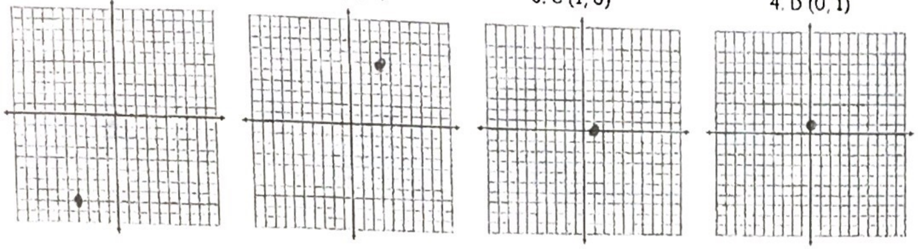
Objective: … graph relations and functions.

2.1 Part 1: Relations and Functions

Warm Up

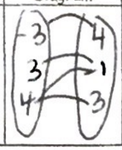
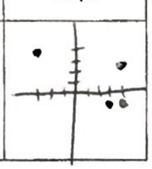
Graph and label each ordered pair on the coordinate plane.

1. A (-4, -8) 2. B (3, 6) 3. C (1, 0) 4. D (0, 1)



Key Concepts

RELATION - a set of pairs of input and output values.

Four Ways to Represent Relations			
Ordered Pairs	Mapping Diagram	Table of Values	Graph
(-3, 4) (3, -1) (4, -1) (4, 3)		x | y -3 | 4 3 | -1 4 | -1 4 | 3	

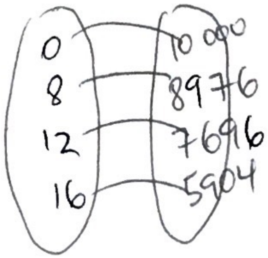
Examples

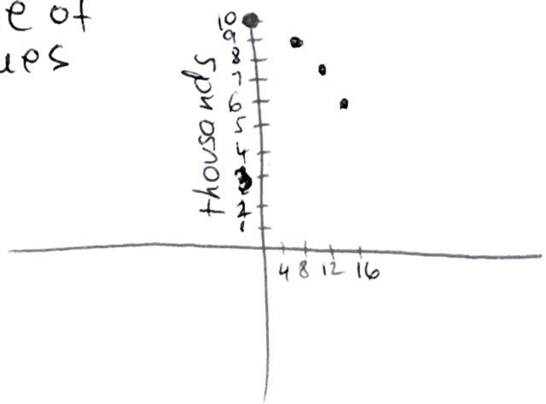
1. When skydivers jump out of an airplane, they experience free fall. At 0 seconds, they are at 10,000ft, 8 seconds, they are at 8976ft, 12 seconds, they are at 7696ft, and 16 seconds, they are at 5904ft. How can you represent this relation in four different ways?

(0, 10000)
(8, 8976)
(12, 7696)
(16, 5904)

x	y
0	10 000
8	8976
12	7696
16	5904

table of values





Key Concepts

DOMAIN - the set of all inputs (x-coordinates)

RANGE - the set of all outputs (y-coordinates)

FUNCTION - a relation in which each element in the domain corresponds to exactly one element of the range.

VERTICAL LINE TEST - if any vertical line passes through more than one point on the graph of a relation, then it is *not* a function.

Examples

2. Determine whether each relation is a function. State the domain and range.

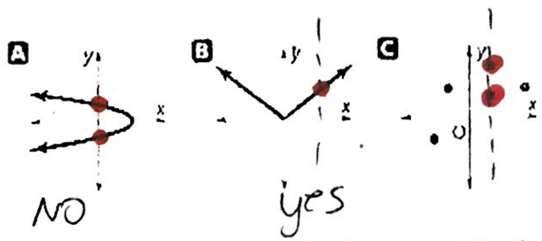
a) {(0, 1), (1, 0), (2, 1), (3, 1), (4, 2)}
yes

b) {(1, 4), (3, 2), (5, 2), (1, -8), (6, 7)}
NO

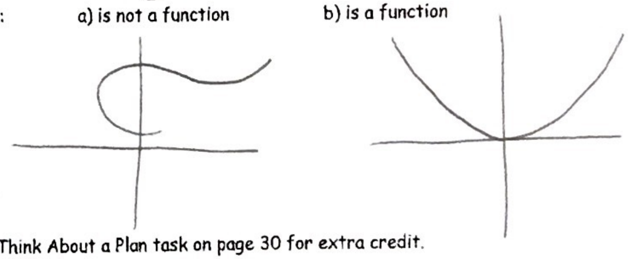
c) {(1, 3), (2, 3), (3, 3), (4, 3), (5, 3)}
yes

d) {(4, 9), (4, 3), (4, 0), (4, 4), (4, 1)}
NO

3. Use the vertical line test. Which graphs represent a function?

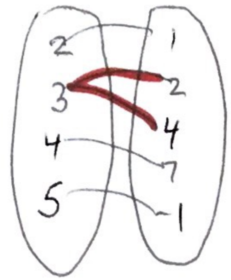


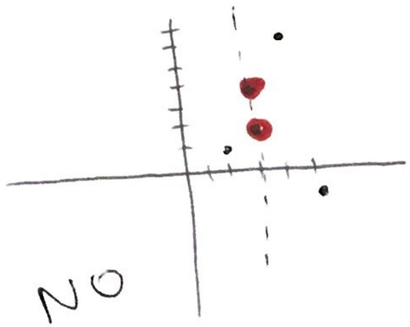
4. Create a relation that: a) is not a function b) is a function



<u>**Challenge/Early finishers**</u> do Think About a Plan task on page 30 for extra credit.

<u>**Exit ticket:**</u> Express the relation {(2,1), (3,2), (3, 4), (4, 7), (5, -1)} using mapping diagram and graph. Is this relation a function?



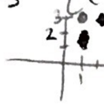


NO

... pairs, and create functions to describe real life

Section 2.1 Part 2: Relations and Functions

1. Can you have a relation that is not a function? If yes, give an example. yes $\{(1,2),(1,3),(2,3)\}$



doesn't pass vertical line test

2. Can you have a function that is not a relation? If yes, give an example.

No, all functions are relations

Key Concepts

Function rule - an equation that represents an output value in terms of an input value. You can write the function rule in function notation.

independent variable - x, represents the input value.

dependent variable - y, represents the output value. (Call dependent because it depends on the input value)

Examples

1. Evaluate the function for the given value of x, and write the input x and output $f(x)$ in an ordered pair.
   $f(x) = -2x + 11$ for $x = 5, -3,$ and 0

$f(5) = -2(5) + 11 = 1$
$f(-3) = -2(-3) + 11 = 6 + 11 = 17$
$f(0) = 11$

2. Write a function rule to model the cost per month of a long-distance cell phone calling plan. Then evaluate the function for given time the cellphone is used.

Monthly service fee: \$4.99
Rate per minute: \$.10
Time used: 2.5 hours
$= 150\text{min}$

$C = 4.99 + 0.10m$

$C = 4.99 + 0.1\cancel{0} \cdot 15\cancel{0}$
$4.99 + 15 = 19.99$

White board activity #1-4 page 29

must complete on your own

Challenge/Early finishers do #5 for extra credit.

Exit ticket: Create three coordinate points given the function f(x)= -5x+1 and the x values -4, -2 and 0

$f(-4) = -5(-4) + 1 = 20 + 1 = 21$
$f(-2) = -5(-2) + 1 = 10 + 1 = 11$
$f(0) = -5(0) + 1 = 1$

process, or steps for calculation from a context.

Objective: Students will be able to graph linear equations. Students will be able to write equations of line in y intercept form.

2.3: Linear Functions and Slope-Intercept Form

Warm Up

Evaluate each expression for $x = -2$, and 0.

1. $f(x) = 2x + 7$

$f(-2) = 2(-2) + 7$
$-4 + 7$
$= 3$
$f(0) = 7$

2. $f(x) = 3x - 2$

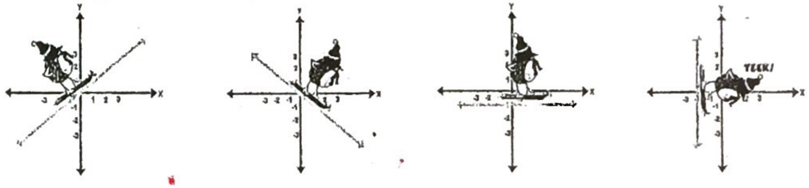
$f(-2) = 3(-2) - 2$
$= -6 - 2 = -8$
$f(0) = -2$

Key Concepts

slope - the rate of change

$$\text{Slope} = \frac{\text{vertical change (rise)}}{\text{horizontal change (run)}} = \frac{y_2 - y_1}{x_2 - x_1}$$

POSITIVE NEGATIVE ZERO UNDEFINED



LINEAR FUNCTION a function whose graph is a line

LINEAR EQUATION - represents a linear function where a solution is any ordered pair (x,y) that makes the equation true.

y-intercept - the point in which a line crosses the y-axis (when x=0)
Any number of a form (0,n) is a y intercept

x-intercept - the point in which a line crosses the x-axis (when y=0)
Any number of a form (n,0) is a x intercept

Slope Intercept Form
$y = mx + b$

m = slope; b= y-intercept

2 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data ...ted to data to solve problems in the context of the data.

...ves: Students will write linear equations that model real-world data. Students will make predictions from linear models based upon the data.

2-5 Using Linear Models

Warm up

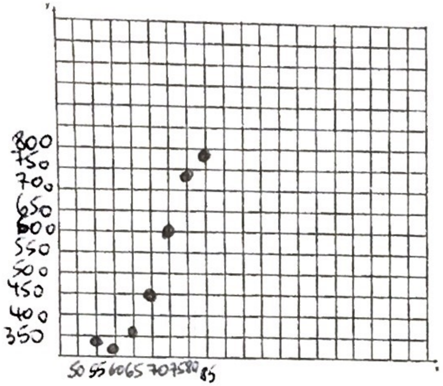
Perform the calculator steps on the bottom of this page, using the values given in the table below.

EXAMPLE

A convenience store manager notices that sales of soft drinks are higher on hotter days, so he assembles the data in the table.

(a) Make a scatter plot of the data.

High Temperature (°F)	Number of cans sold
55	340
58	335
64	410
68	460
70	450
75	610
80	735
84	780



(b) Find and graph a linear regression equation that models the data. use steps on the bottom of this page

y # of cans

x temperature

Equation: y=16.42x − 621.83

(c) Use the model to predict soft-drink sales if the temperature is 95°F.

y=16.42·95 − 621.83

= 938.07 about 938 cans

(d) What does the model predict for the temperature if the number of cans sold was only 95?

95 = 16.42·x − 621.83

716.83 = 16.42x

$\boxed{x=43.66}$

Casio calculator steps for finding the line of best fit:

1. Turn on the calculator :-D
2. MENU
3. Press number 2, or scroll to the right to Statistics, then press EXE button
4. If the lists are not clear, scroll up until List 1 is highlighted, then press F6, then F4, then F1. Repeat for other lists if necessary.
5. Enter the first column for List 1, second column values for List 2
6. Press F6 until you see CALC (F2) then press F2.
7. Press F3 then F1, and F1 again
8. Write down the information that shows up on your screen in y-intercept form. High r value, means strong correlation.

Examples 2-3 continued

1. Find the slope of the line through the points:
   a. (3, 0) and (5, 8) b. (1, -4) and (2, -5) c. (-2, 7) and (8, -6)

$m=\frac{y_2-y_1}{x_2-x_1}=\frac{8-0}{5-3}=\frac{8}{2}=4$ $\frac{-5-(-4)}{2-1}=\frac{-1}{1}=-1$ $\frac{-6-7}{8-(-2)}=\frac{-13}{10}=-1.3$

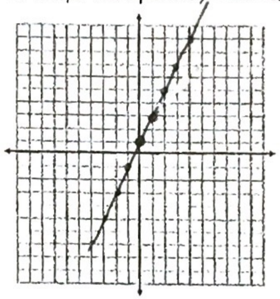
2. What is an equation of the line that has a slope of 1/5 and the y-intercept is (0, -3)?

$y=mx+b$ $y=\frac{1}{5}x-3$ b

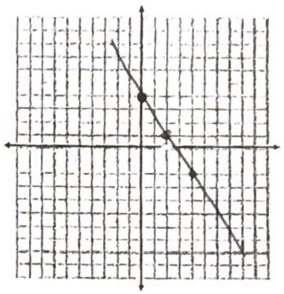
3. Write the equation in slope-intercept form and then find the slope and y-intercept of $-7x+2y=8$.

$\frac{2y}{2}=\frac{7x}{2}+\frac{8}{2}$ $y=\frac{7}{2}x+4$

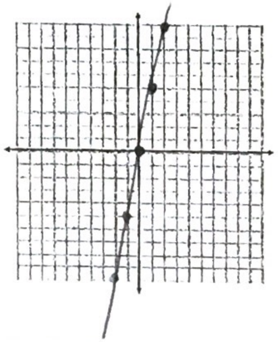
4. Graph the equation y= 2x + 1.



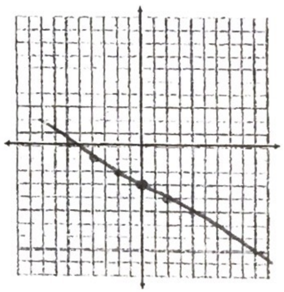
5. Graph the equation y= -3/2x+4



6. Graph the equation y= 5x



7. Graph the equation y=-1/2 x -3



White board activity #1-5 page 37

Challenge/Early finishers do #6 for extra credit.

Exit ticket: Graph y = -3/4x +5

WORKBOOK pg 37 (complete on your own)

1)

2)

3)

4)

5)

For each of the following, write the prediction equation and then solve the problem.

1) A student who waits on tables at a restaurant recorded the cost of meals and the tip left by single diners.

Meal Cost	$4.75	$6.84	$12.52	$20.42	$8.97
Tip	$0.50	$0.90	$1.50	$3.00	$1.00

If the next diner orders a meal costing $10.50 (x), how much tip should the waiter expect to receive?

$y=0.16\cdot(10.50)-0.3$

Equation $y=0.16x-0.3$ Tip expected 1.38

2). The table below gives the number of hours spent studying for a science exam (x) and the final exam grade (y).

hours X	2	5	1	0	4	2	3
Grade Y	77	92	70	63	90	75	84

Predict the exam grade of a student who studied for 6 hours. X $y=6.09(6)+63.93$ $=100.47$

Equation $y=6.09x+63.93$ Grade expected 100

3) The table below shows the lengths and corresponding ideal weights of sand sharks.

x Length	60	62	64	66	68	70	72
y Weight	105	114	124	131	139	149	158

Predict the weight of a sand shark whose length is 75 inches (x). $y=4.36(75)-156.14$ $=170.86$ ≈ 171

Equation $y=4.36x-156.14$ Weight expected 171

4) The table below gives the height and shoe sizes of six randomly selected men.

x Height	67	70	73.5	75	78	66
y Shoe size	8.5	9.5	11	12	13	8

If a man has a shoe size of 10.5 (y), what would be his predicted height? $10.5=0.42x-19.81$
$+19.81 \quad +19.81$

Equation $y=0.42x-19.81$ Height expected $\frac{30.31}{0.42}=\frac{0.42x}{0.42}$

x = ? $\boxed{x\approx 72}$ $x=72.17$

EXIT TICKET: CREATE A LINEAR MODEL FOR THE DATA IN THE TABLE BELOW IN Y-INT FORM

X	0	1	2	3	4	5
Y	1	0	3	3	5	6

complete on your own

Standard: ■ A2.A.REI.D.6 (formerly A.REI.11) Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the approximate solutions using technology. ★*Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

Objectives: Students will graph and find solutions of absolute value functions using a variety of strategies. The students will apply translations, stretches, compressions, and reflections to the absolute value function

2.7: Absolute Value Functions and Graphs

Students will be able to graph absolute value functions

Warm Up

Solve each absolute value equation.

1) $|x-3|+2=7$
$\quad -2 \quad -2$

$|x-3|=5$

$x-3=5 \qquad x-3=-5$

$x=8 \qquad x=-2$

2) $\frac{1}{3}|5x-3|=6$

$|5x-3|=18$

$5x-3=18 \qquad 5x-3=-18$

$5x=21 \qquad 5x=-15$

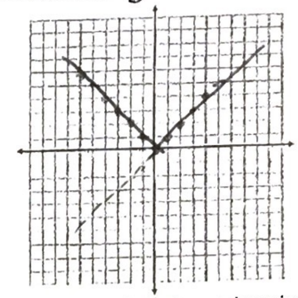
$x=\frac{21}{5} \qquad x=-3$

Key Concepts

Graph of Absolute Value Function $f(x)=|x|$

it's the same as y=x with negative side fliped back up

X	0	1	2	3	-1	-2	-3
y	0	1	2	3	1	2	3



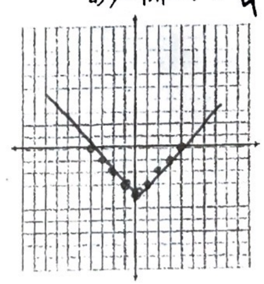
Line of symmetry - the line that divides a figure into two parts that are mirror images

vertex - a point where the function reaches a maximum or minimum value

Guided practice

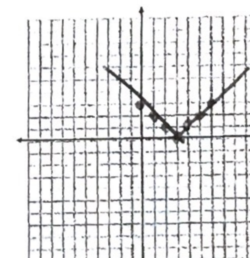
1. Graph the absolute value functions:

a) $y=|x|-4$ down 4



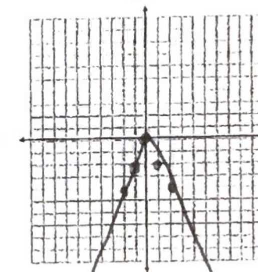
X	y
0	-4
1	-3
2	-2
3	-1
4	0
5	1
-1	-3

b) $y=|x-3|$ right 3



X	y
3	0
2	1
1	2
0	3
4	1
5	2
6	3

c) $y=-2|x|$ stretch by 2 reflection "slope" -2 on one side



X	y
0	0
1	-2
2	-4
-1	-2
-2	-4

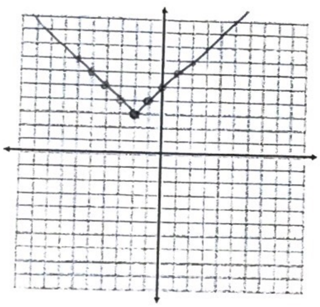
Summary

Transformations of y = |x|	
Vertical Translation (k units) *Up:* $y = \|x\| + k$ *Down:* $y = \|x\| - k$	**Horizontal Translation (h units)** *Right:* $y = \|x - h\|$ *Left:* $y = \|x + h\|$
Vertical Stretch/ Compression *Stretch (a>1):* $y = a\|x\|$ *Compression (0<a<1):* $y = a\|x\|$	**Reflection** *x-axis:* $y = -\|x\|$

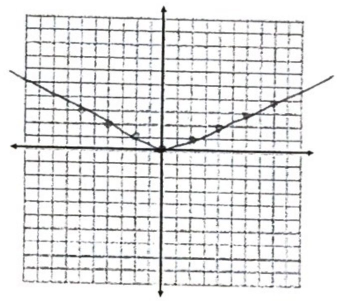
Group practice

2. Graph each absolute value function.

a. $y = |x + 2| + 3$



b. $y = 1/2|x|$



Key Concepts

General Form of the Absolute Value Function

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

LEFT + RIGHT −

up + down −

Stretch/Compression Factor is $|a|$, Vertex is (h, k), Axis of Symmetry is $x = h$

Examples

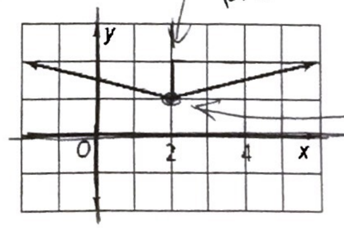
3. Without graphing, identify the vertex, axis of symmetry, and transformations of $f(x) = -3|x - 1| + 4$ from the parent function $f(x) = |x|$.

vertex (1,4) reflection over x-axis

stretch 3

4. Write an absolute value equation for the given graph.

"slope" up 1 right 4 $= \frac{1}{4}$



vertex (2,1)

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

White board activity #1-3 page 53 do on your own

Challenge/Early finishers do #4 for extra credit.

Exit ticket: Graph = $|x + 1| - 3$