Name: Key

UNIT 3 RECOVERY Packet

This packet is due, in its entirety, by **MONDAY DECEMBER 2ND**. Following the completion of this packet, you will be required to take a unit assessment, similar to that given at the beginning of the year.

KEY CONCEPTS:

-**Function**: yes or no?

-**Characteristics** of Functions: Domain, Range, x intercept, y intercept, absolute and relative maximums, absolute and relative minimums, Intervals of Increase, Intervals of Decrease, Constant Intervals, End Behavior, Continuous/Discrete/Discontinuous

-**Function Notation**: when given equations and graphs

RELATION vs. FUNCTIONS: How do you tell if a relation is a function?

-**Relation**: Any set of (x, y) coordinates

-**Function**: a set of (x, y) coordinates in which X VALUES DO NOT REPEAT.

When given a set of coordinates, look at only the x values to see if the same value happens more than one time. If the SAME X VALUE happens more than once, then it is NOT A FUNCTION, only a relation.

Ex. 1: Is this set of coordinates a function?

(2,6), (-2, 8). (3, 6), (9, -2)

Remember, each coordinate is (x, y), and we only need to look at the X values.

(**2**, 6), (**-2**, 8). (**3**, 6), (**9**, -2)

This set has x values of 2, -2, 3, and 9. It does NOT REPEAT the same x more than once, so

YES, IT IS A FUNCTION.

*Note: It does not matter if the Y-VALUES repeat. (see 6 is a y value that happens twice).

Ex. 2: Is this set of coordinates a function?

Focus only on the X Values:

(**3**, 4), (**8**, 7), (**2**, 3), (**-8**, 7), (**2**, 6)

The x values here are 3, 8, 2, -8, and 2. The 2 is an x value that happens twice, so this is NOT A FUNCTION.

YOU TRY:

Function or Relation? $\{(1, 1), (-2, 3), (5, 1), (6, 2), (8, -4), (-1, 5)\}$ function

Function or Relation? $\{(2, 5), (-2, 3), (5, 7), (-2, 9), (4, 5), (-8, 7)\}$ relation

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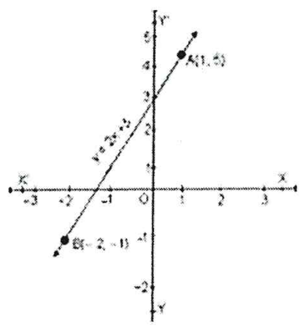
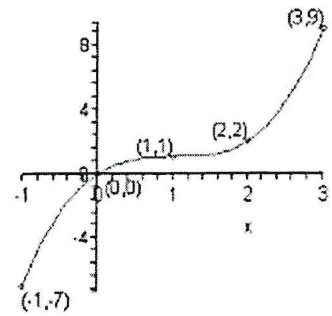
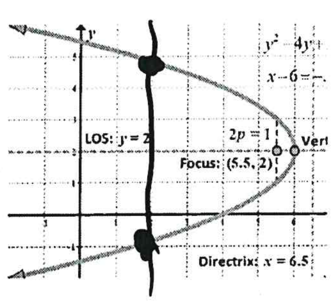
When given a graph, we can test whether it is a function by using the **Vertical Line Test.**

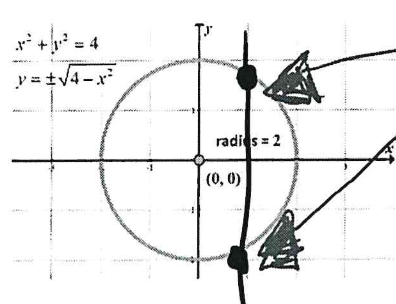
If a vertical line passes through your graph and hits in ONLY ONE POINT, then IT IS A FUNCTION. This means that the X value only happens one time.





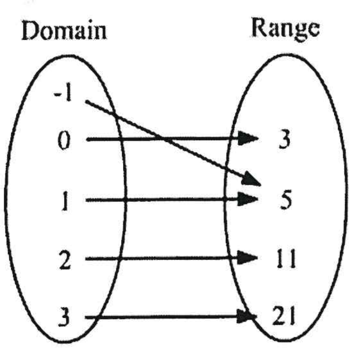
If the vertical line hits in MORE THAN ONE POINT, then it is NOT A FUNCTION, only a relation.





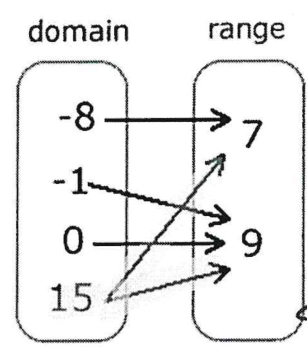
hits twice,
Not a function

When given mapping bubbles, ask yourself " Does the same x value go to more than 1 y value?"



(-1,5)
(0,3)
(1,5)
(2,11)
(3,21)

all x values have different y values, So this IS a function!



(-8,7)
(-1,9)
(0,9)
(15,7)
(15,9)

Same x value has 2 different y values, so NOT a function!

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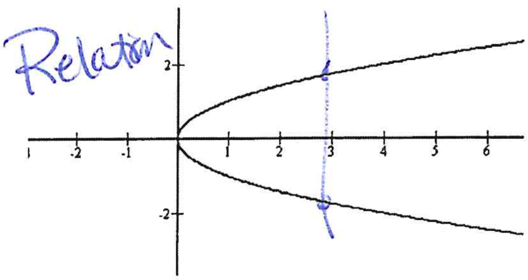
YOU TRY: *For the following determine if they are a function or a relation*

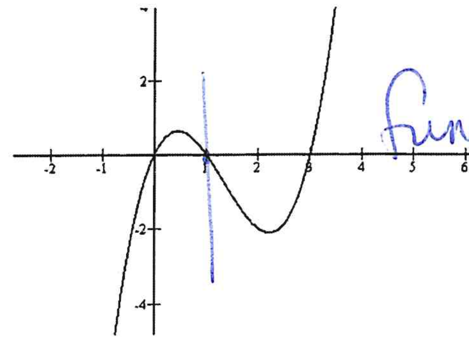
1. (3,5), (5, 3), (2, 5), (1, 6), (7, 3) function

2. (0, -2), (-2, 4), (6, 1), (2, 8), (-2, 4) Relation

3. Relation

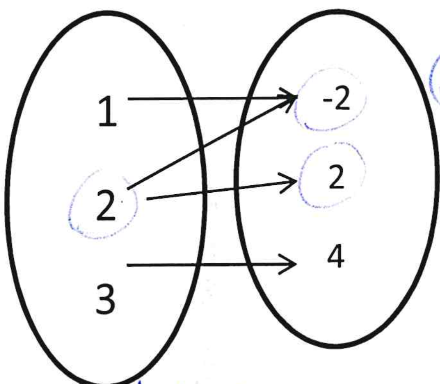


4.



function

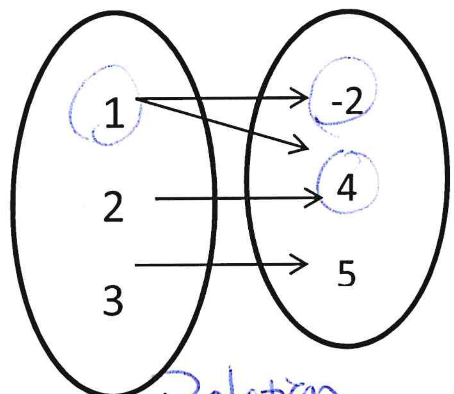
5.



(2, -2)
(2, 2)

Relation

6.



(1, -2)
(1, 4)

Relation

FUNCTION NOTATION: **f(x)** **"f of x"**

The expression "$f(x)$" means "a formula, named f, has x as its input variable". It does *not* mean "multiply f and x"!

Remember: The notation "$f(x)$" is exactly the same thing as "y". You can even label the y-axis on your graphs with "$f(x)$", if you feel like it.

$f(x) = y$

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Use the graph and table to find the following

f(x) = y

1. $f(-1)$ = <u>-3</u>

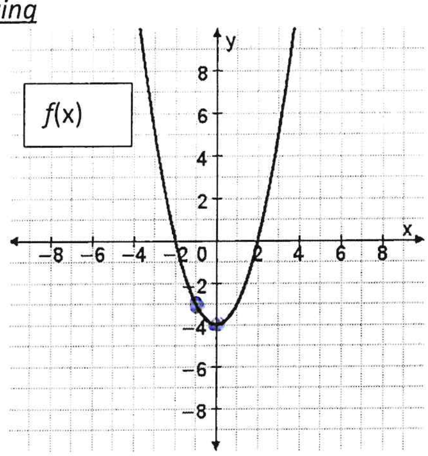
2. $g(-1)$ = <u>1</u>

3. $g(0)$ = <u>4</u>

4. x = <u>3</u>, if $g(x) = -3$

5. x = <u>0</u>, if $f(x) = -4$ y (y = -4 on f(x) graph)

6. x = <u>-1</u>, if $g(x) = 1$



x	g(x)
-3	8
-1	1
0	4
1	2
3	-3

CHARACTERISTICS OF FUNCTIONS:

Type of Function:

x-intercepts: list all the values where the function crosses the <u>X-axis</u>. Should be written as an ordered pair: (#, 0)

y-intercepts: list all the values where the function crosses the <u>y-axis</u>. Should be written as an ordered pair: (0, #)

Maximum: the <u>highest</u> <u>point</u> on the graph. (x, y)

Minimum: the <u>Lowest</u> <u>point</u> on the graph. (x, y)

Increasing or Decreasing? Read the graph from <u>left</u> to <u>right</u>. State if the function is <u>going up</u> or <u>down</u>.

Evaluate f(-3): Use the graph or plug into the equation to evaluate what the <u>y-value</u> is, when x = -3.

Domain: the <u>X values</u> or <u>input</u> of the function how far left to how far right

Range: the <u>y values</u> or <u>output</u> of the function how low to how high

Interval of Increase/Decrease: Reading the graph from left to right, the <u>X-values</u> that the graph is either increasing or decreasing over.

End Behavior: the values that <u>y</u> obtains as x increases towards <u>negative</u> infinity or positive <u>infinity</u>

Always use these same statements: $as\ x \to \infty, y \to$ ____

$as\ x \to -\infty, y \to$ ____

what y value is the arrow pointing to?

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Interval Notation: A notation for representing an Interval as a pair of numbers. The numbers are x-values of the interval. Brackets and/or parentheses are used to show whether the endpoints are included or excluded. For example [3,8) is the interval of real numbers between 3 and 8, including 3 and excluding 8.

1. Domain: left, right $(-\infty, \infty)$

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

x-intercepts: $(4, 0)$

y-intercepts: $(0, -5)$

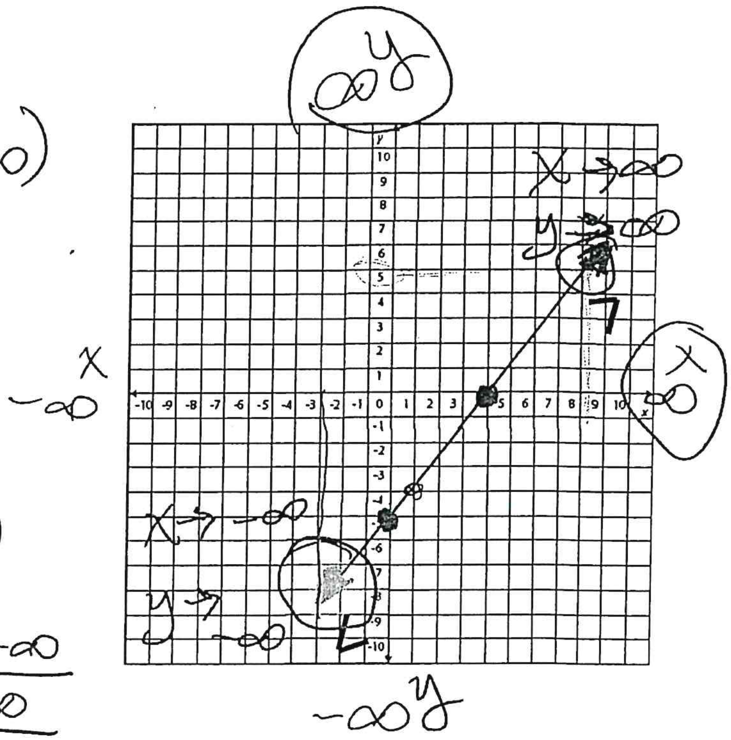
Maximum: none

Minimum: none

Increasing or Decreasing: $(-\infty, \infty)$

End behavior: as $x \to -\infty$, $y \to -\infty$

as $x \to \infty$, $y \to \infty$



Evaluate: f(8) = 5; f(1) = −4; f(x) = −5, x = 0

f(x) = y

when x = 8, find y

x = 1

y = −4

f(x) = y

when y = −5, find x

2. Domain: [−5, 4]

Range: [−4, 4]

x-intercepts: (−4.5, 0), (−1, 0), (3, 0)

y-intercepts: (0, −2)

Maximum: (−3, 4)

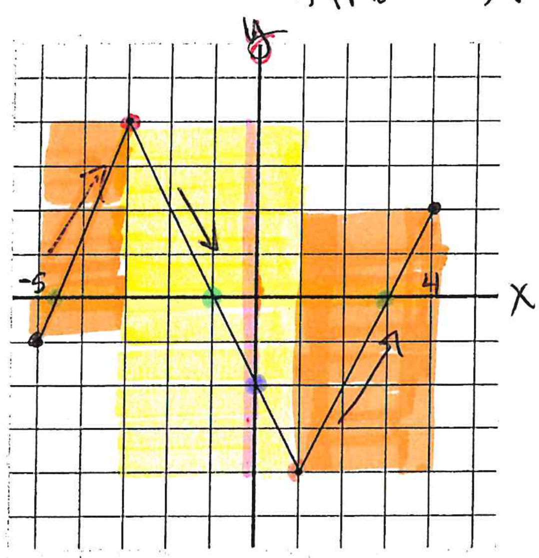
Minimum: (1, −4)

~~Increasing or Decreasing~~:

x values

Interval of Increase: [−5, −3) ∪ (1, 4]

Interval of Decrease: (−3, 1)



Evaluate: f(−3) = 4; f(1) = −4; f(4) = 2

f(x) = y

x = −3

y = 4

x = 1

x = 4

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left, right x values — low, high y values

3. Domain: [-4, 4]

Range: [-2, 3]

x-intercepts: (-2.5, 0) & (2, 0)

y-intercepts: (0, 3)

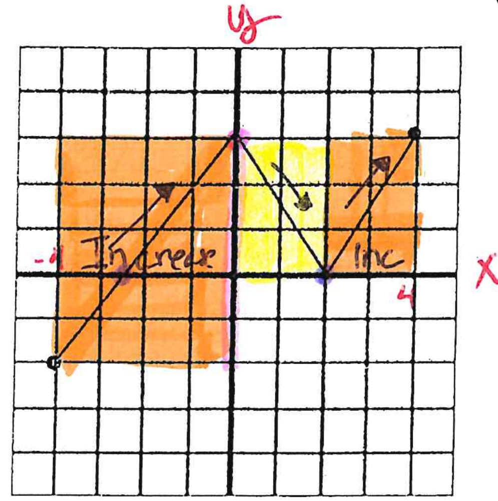
Maximum: no absolute, 2 Relative max (0, 3) & (4, 3)

Minimum: Absolute Min (-4, -2) Relative min (2, 0)

Interval of Increase: [-4, 0) ∪ (2, 4]

Interval of Decrease: (0, 2)

End Behavior: none, no arrows



4. Domain: (-2, 4)

Range: [-3, 4)

x-intercepts: (-0.5, 0), (2.5, 0)

y-intercepts: (0, -.75)

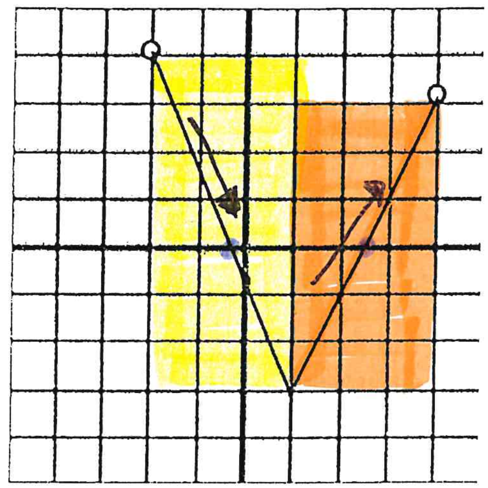
Maximum: Abs. (-2, 4)

Minimum: Abs. (1, -3)

Interval of Increase: (1, 4)

Interval of Decrease: (-2, 1)

End Behavior: none



5. Domain: [0, ∞)

Range: [200, ∞)

x-intercepts: none

y-intercepts: (0, 200)

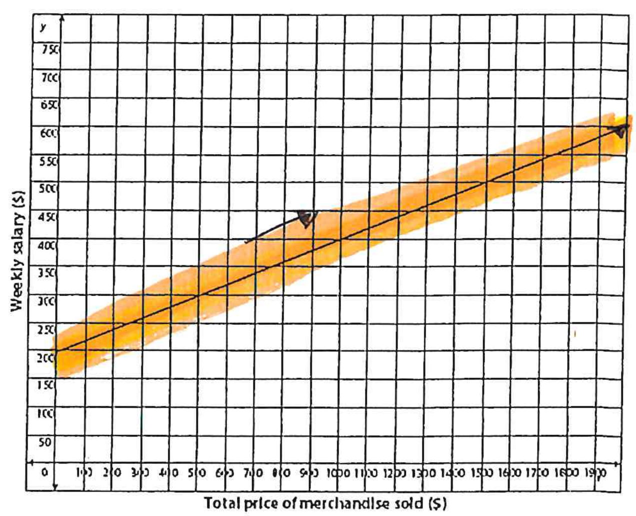
Maximum: none

Minimum: (0, 200)

Interval of Increase: [0, ∞)

Interval of Decrease: none

End Behavior: as $x \to \infty$, $y \to \infty$



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6. Domain: (-∞,∞)

Range: (-∞,∞)

x-intercepts: (3,0)

y-intercepts: (0,2)

Maximum: none

Minimum: none

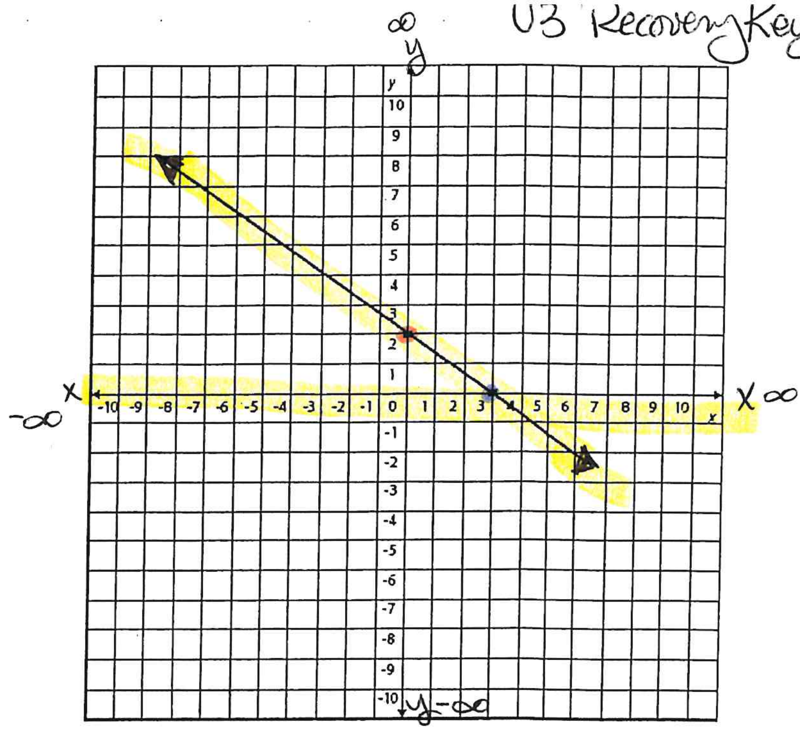
Interval of Increase: none

Interval of Decrease: (-∞,∞)

End Behavior:

as x→-∞, y→ ∞

as x→∞, y→ -∞



7. Domain: (-5,4)

Range: [-4,4]

x-intercepts: (-4.5,0),(-1,0),(3,0)

y-intercepts: (0,-2)

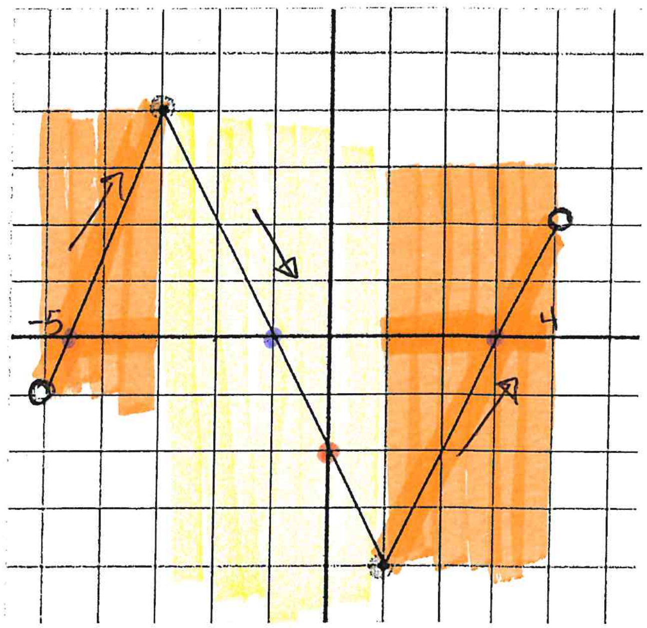
Maximum: Abs.(-3,4)

Minimum: (1,-4)

Interval of Increase: (-5,-3) ∪ (1,4)

Interval of Decrease: (-3, 1)

End Behavior: none



8. Domain: (-∞, 4]

Range: [-2.5,∞)

x-intercepts: (-2.5,0), (.5,0), (3,0)

y-intercepts: (0,-1)

Maximum: none

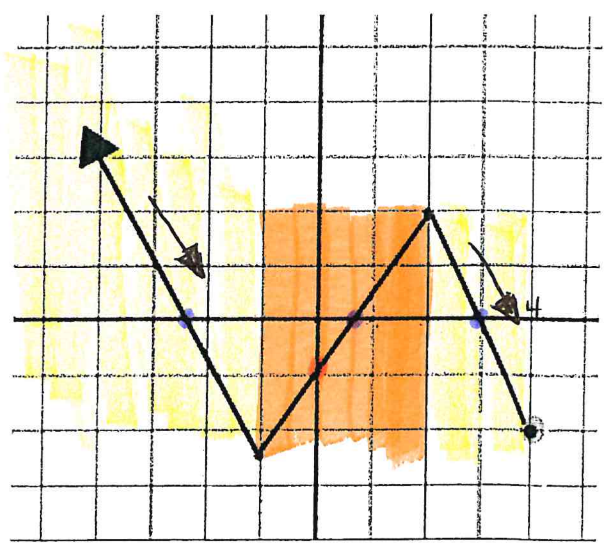
Minimum: (-1,-2.5)

Interval of Increase: (-1,2)

Interval of Decrease: (-∞,-1) ∪ (2,4]

End Behavior:

as x → -∞, y → ∞



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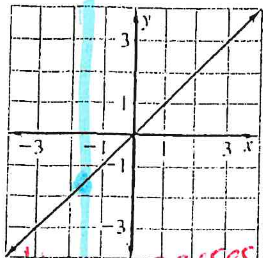
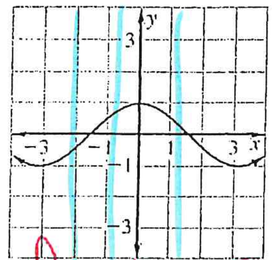
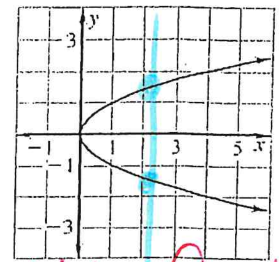
Decide whether the graph represents y as a function of x. Explain your reasoning.

1. 

function, passes the Vertical line Test

2. 

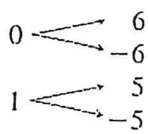
function, passes VLT

3. 

Not a function Relation fails the VLT

Decide whether the relation is a function. If it is a function, give the domain and the range.

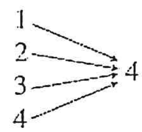
4. Input Output



(0,6)
(0,-6)
(1,5)
(1,-5)

x values repeat, Not a function

5. Input Output



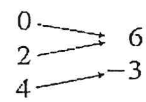
(1,4)
(2,4)
(3,4)
(4,4)

Function

D: {1,2,3,4}

R: {4}

6. Input Output



(0,6)
(2,6)
(4,-3)

Function

D: {0,2,4}

R: {-3,6}

7) Tell how to read the statement $f(4) = 16$. Interpret what it means in terms of input and output values.

"f of 4 is 16". When 4 is put into the function (input) (x), 16 is the result (output) (y)

Perform the given operations

8) $f(x) = -4x + 1$ and $g(x) = 2x - 3$

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

b) $f(x) - g(x) =$ $(-4x+1)-(2x-3)$ $= -4x+1-2x+3$ $\boxed{-6x+4}$

9) $f(x) = 6x-7$ and $g(x) = -x - 3$

a) $f(x) + g(x) =$ $(6x-7)+(-x-3)$ $= 6x-7-x-3$ $\boxed{5x-10}$

b) $f(x) - g(x) =$ $(6x-7)-(-x-3)$ $= 6x-7+x+3$ $\boxed{7x-4}$

10) $f(x) = 3$ and $g(x) = 2x - 3$

a) $f(x) \times g(x) =$ $3(2x-3)$ $\boxed{6x-9}$

b) $f(x) + g(x) =$ $3+(2x-3)$ $= 3+2x-3$ $\boxed{2x}$

11) $f(x) = -5x + 4$	12) $f(x) = 3x^2 + 2x - 4$	13) $f(x) = 3^x - 5$
a) $f(-6) = -5(-6)+4$ $\boxed{f(-6)=34}$	a) $f(-2) = 3(-2)^2+2(-2)-4$ $\boxed{f(-2)=4}$	a) $f(2) = 3^2 - 5$ $\boxed{f(2)=4}$