Notes 2-1 Relations & Functions Name _____

Algebra II Period _____

A relation is a pairing of input values with output values.

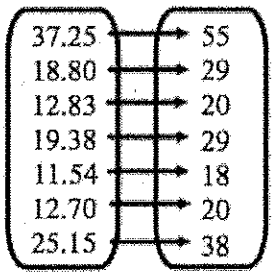
The domain is the input values and usually represented with x.

The range is the output values and usually represented with y.

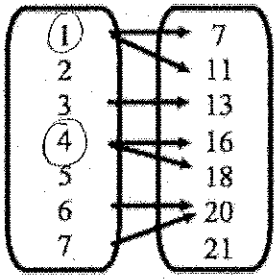
There are four ways to represent a relation: list of points, mapping diagram, table, graph.

A function is a relation that has only one output value for every input. No x values repeat!

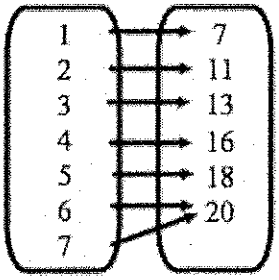
*in mapping only one arrow from every input.



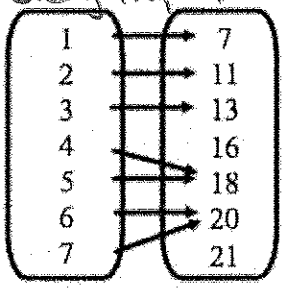
function, only on output for every input



not a function 1 and 4 have two outputs



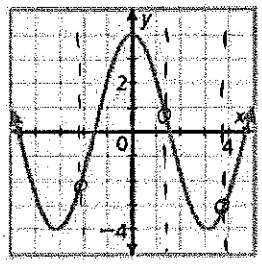
function, one output for every input



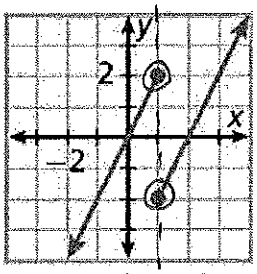
function, one output for every input

The Vertical Line Test – If a vertical ↕ line touches more than one point simultaneously, then the graph is not a function.

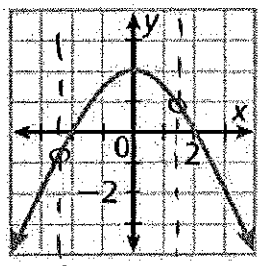
Which of these graphs shows a function?



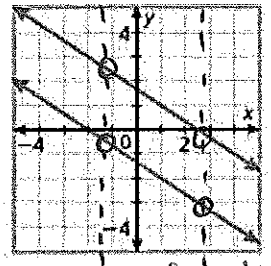
function



not a function



function



not a function

Function Notation: $f(x) = 5x + 3$

independent variable – x, the input

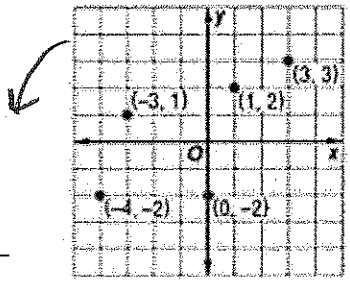
dependent variable – f(x) or y, the output after substituting x

Types of functions:

one-to-one function – Graph passes both the vertical ↕ line test and a horizontal ↔ line test. No x's and no y's repeat.

discrete function – set of coordinate points that are not connected.

continuous function – the relation can be graphed or traced with a line or smooth curve. Traced without picking up pencil.



(x) Domain: -4, -3, 0, 1, 3

(y) Range: -2, 1, -2, 2, 3

Function? Yes * no x's repeat What kind? discrete * not connected

(x, y)

{(-3, 0), (-2, 2), (-1, 4), (0, 6), (1, 8)}

(x) Domain: -3, -2, -1, 0, 1

(y) Range: 0, 2, 4, 6, 8

Function? Yes

What kind? one-to-one ← no x or y repeat

discrete not connected

Given: $f(x) = 5x + 3$

If the domain (x) of $f(x)$ is {-1, 0, 1, 2}, plug in for x then what is the range of $f(x)$? -2, 3, 8, 13

Is it a continuous or discrete function? discrete over this domain

If the domain of $f(x)$ is all real numbers, then what is the range of $f(x)$? All real numbers

Is it a continuous or discrete function? continuous over this domain

plug into calculator to look at table for x + y values and to look at graph

Evaluate:

$g(x) = x^2 - x - 2$ $g(-1) =$ 0 $g(0) =$ -2 $g(w) =$ $w^2 - w - 2$

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

$g(0) = (0)^2 - (0) - 2$
$= 0 - 0 - 2$
$= -2$

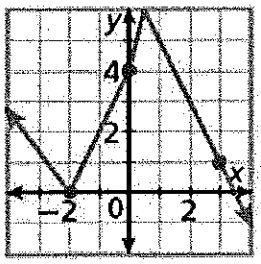
$g(w) = (w)^2 - (w) - 2$
$= w^2 - w - 2$

$h(x) = 4x^2 + 7x$ $h(-2) =$ 2 $h(a) =$ $4a^2+7a$ $h(t+1) =$ $4t^2+15t+11$

$h(-2) = 4(-2)^2 + 7(-2)$
$= 4 \cdot 4 + -14$
$= 16 + -14$
$= 2$

$h(a) = 4(a)^2 + 7(a)$
$= 4a^2 + 7a$

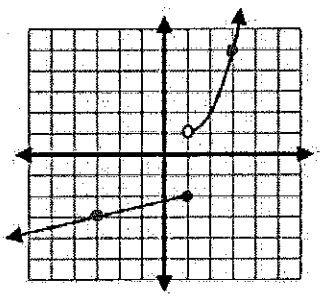
$h(t+1) = 4(t+1)^2 + 7(t+1)$
$= 4(t+1)(t+1) + 7t + 7$
$= 4(t^2 + t + t + 1) + 7t + 7$
$= 4(t^2 + 2t + 1) + 7t + 7$
$= 4t^2 + 8t + 4 + 7t + 7$
$= 4t^2 + 15t + 11$



$f(-2) =$ 0 $f(0) =$ 4 $f(3) =$ 1

find this x value + the coordinating y

(-2, 0) (0, 4) (3, 1)



$g(-3) =$ -3 $g(1) =$ -2 $g(3) =$ 5

find this x + coordinating y

(-3, -3) (1, -2) b/c it's filled in. (1, 1) is not closed (3, 5)

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

On what interval(s) of x is $f(x)$ positive? y value is positive *above x axis

$(-5, -1)$

On what interval(s) of x is $f(x)$ negative? - y value is negative, *below x axis

$(-\infty, -5) \cap (-1, \infty)$

For what value(s) of x is $f(x) = 0$? - y=0 *on x axis

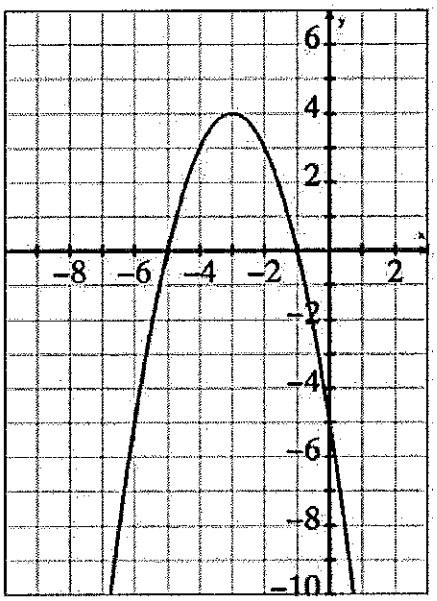
$x = -5$ and $x = -1$

On what interval(s) of x is $f(x)$ increasing? - going up a hill

$(-\infty, -3)$

On what interval(s) of x is $f(x)$ decreasing? - going down a hill

$(-3, \infty)$



Critical Thinking Questions 2-1

1. Why does the Vertical Line Test help us decide if a graph is a function?

   x's can only have 1 y value

2. Give two examples of real-world applications that are best modeled by a discrete function.

   - Sales if cones are sold for $2 each

3. Give two examples of real-world applications that are best modeled by a continuous function.

   $ growth

   temperature rising or dropping in a day