Graph $y = 2x^2 - 4x - 6$ → y intercept

April 29

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

$ac = 1 \times -3 = -3 = (-3)(1)$

$b = -2 = (-3) + 1$

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

$x - 3 = 0$ $\quad$ $x + 1 = 0$

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

$(3, 0)$ $\quad$ $(-1, 0)$

* To find vertex $= \frac{(3-1)}{2} = \frac{2}{2} = 1$

sub $x = 1$ into eq

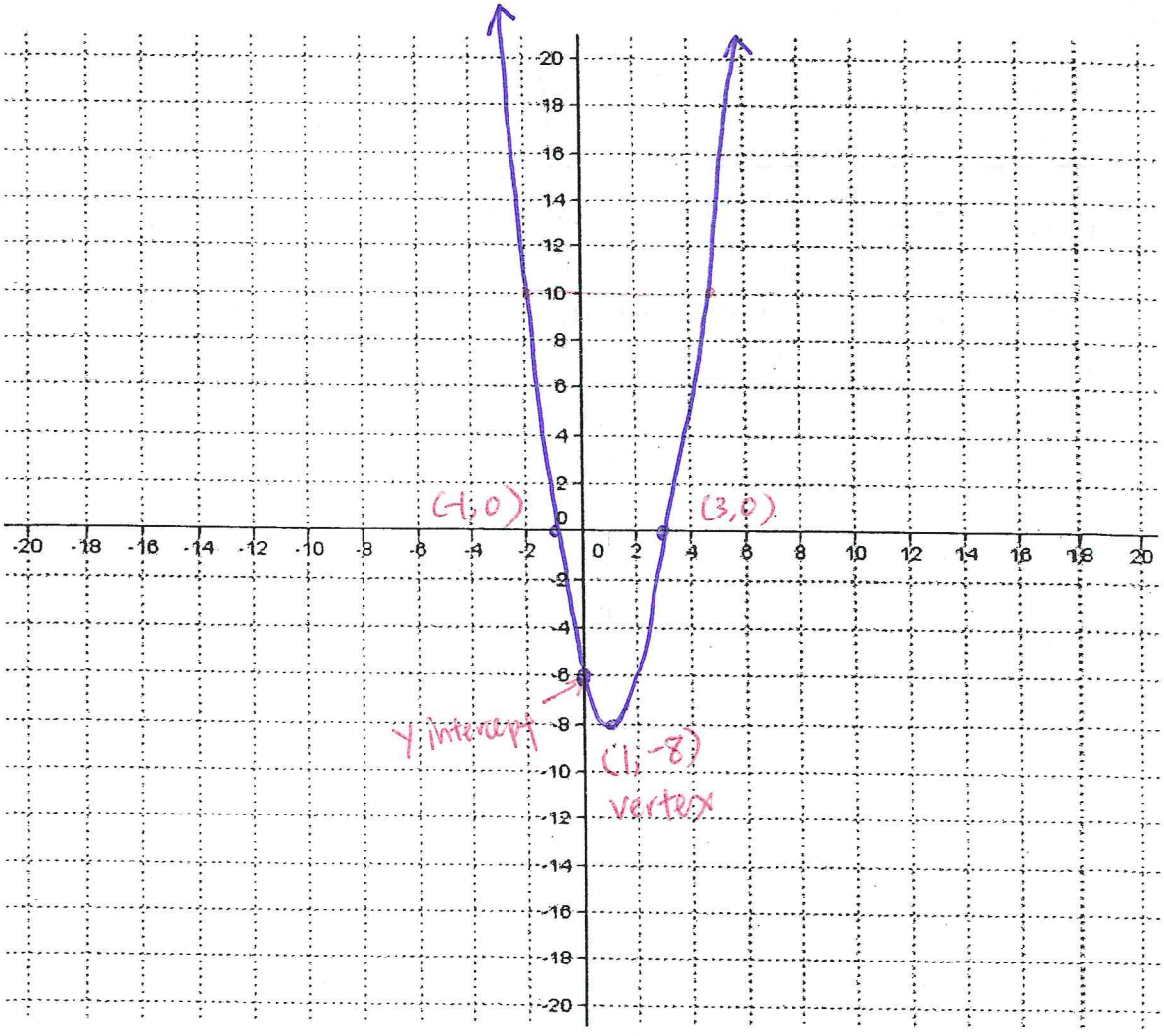
$y = 2(1)^2 - 4(1) - 6$

$y = 2 \cdot 1 - 4 - 6$

$y = -8$

∴ Vertex $= (1, -8)$

* HW: Finish this page and next page * Quiz on Thursday!



For the parabola $y = 2x^2 - 4x - 6$ that you just graphed, for what x-values is the y-value 10? Approximate the x-values from your graph.

When $y = 10 \longrightarrow x = 5$ and -2

* Remember graphing method gives you approximate numbers.

How would you solve for these x-values algebraically? → Set $y = 10$

$10 = 2x^2 - 4x - 6$

$0 = 2x^2 - 4x - 6 - 10$

$0 = 2x^2 - 4x - 16$

$0 = 2(x^2 - 2x - 8)$ → $ac = 1 \times -8$, $ac = -8$, $b = -2$, $(-4) \times 2 = -8$, $(-4) + 2 = -2$

$0 = 2(x - 4)(x + 2)$

$y = 0$ → when $x - 4 = 0$ or $x + 2 = 0$

$\therefore x = 4$ and -2

For the parabola $y = x^2 - 8x + 12$, for what x-values is the y-value -3?

MPM2D
Ms. Kueh

Function Notation, Domain and Range

Relation - a set of ordered pairs $= (x, y)$

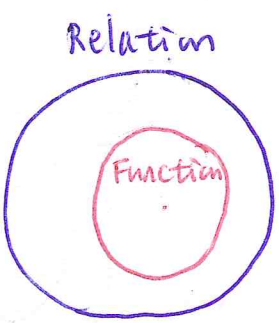
Examples: of Relation

Any line $y = mx + b$ on the Cartesian grid is a relation.

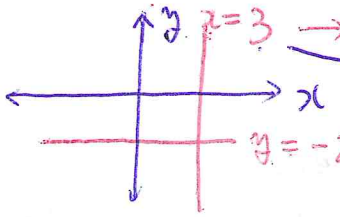
A circle, $(x - 5)^2 + (y + 2)^2 = 25$ is a relation.

The set of points $\{(5, 6), (1, 2), (3, 4), (3, 7)\}$ is an relation.

Any parabola $y = x^2 - 5x + 4$ is a relation.



A **Function** is more restrictive. A function is a relation where **each** x**-value must have only 1** y**-value.** = narrower definition

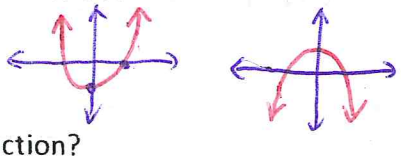


1. Is every line a function?

   No

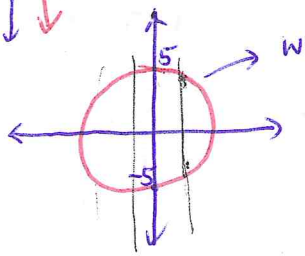
2. Is every parabola a function?

   Yes



3. Is every circle a function?

   No circle is not a function.



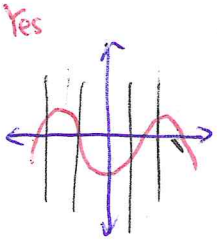
4. List a set of points which is
   a) not a function

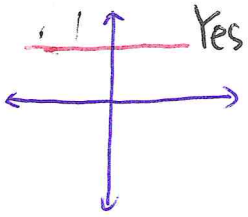
      $\{(10, 5), (10, 7), (11, 8)\}$ because when $x = 10$ → $y = 5$, $y = 7$

   b) a function

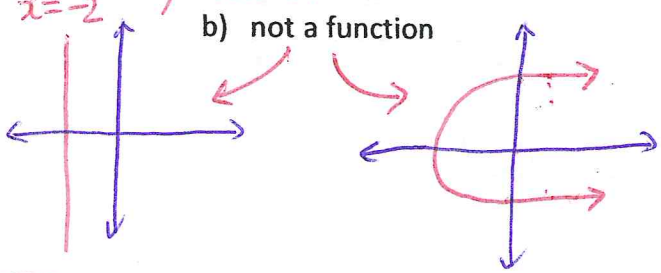
      $\{(1, 3), (2, 3), (3, 4)\}$ because every x value has only one y value.

5. Draw a graph which is
   a) a function



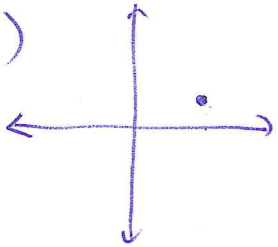


   b) not a function



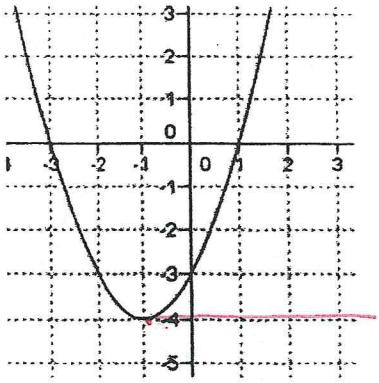
Domain is the set of all x-values of a relation

Range is the set of all y-values of a relation



Find the domain and range of: (Assume the graphs continue)

a)



belongs to

$D = \{x \in \mathbb{R}\}$

real numbers

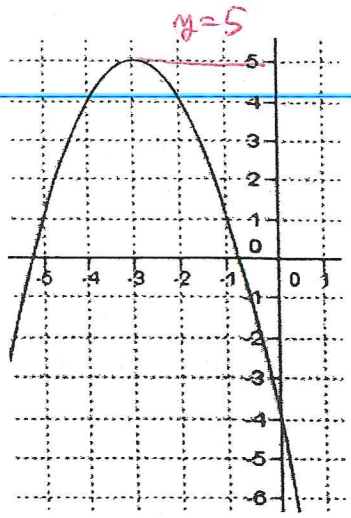
= x can be any real number.

= y can be any real number as long as it is equal or greater than −4

$R = \{y \in \mathbb{R},\ y \geq -4\}$

equal or greater than

b)



$D = \{x \in \mathbb{R}\}$

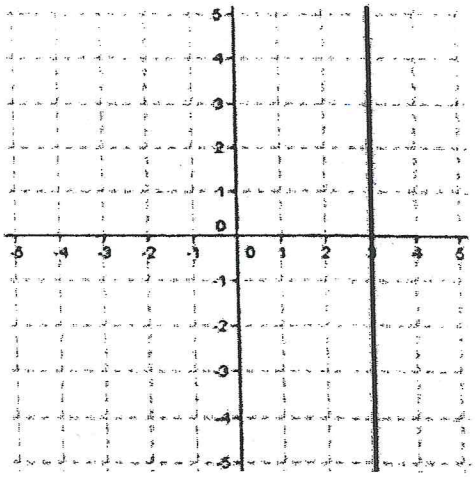
$R = \{y \in \mathbb{R},\ y \leq 5\}$

c)

$D = \{x \in \mathbb{R}\}$

$R = \{y \in \mathbb{R},\ y \geq 1$

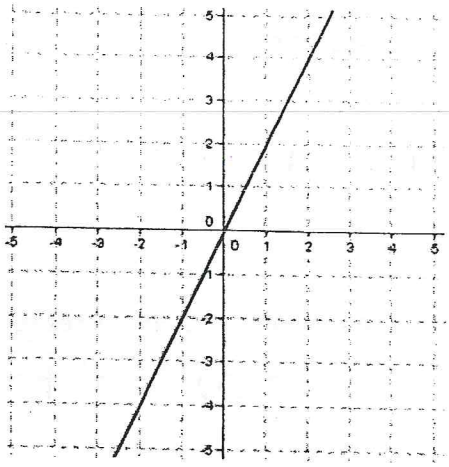
d)



$D = \{3\}$

$R = \{y \in \mathbb{R}\}$

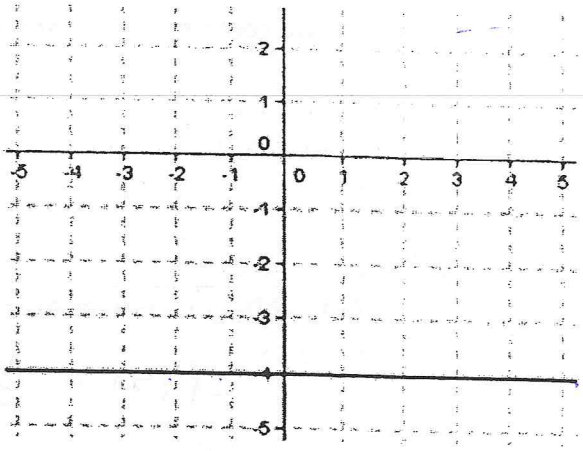
e)



$D = \{x \in \mathbb{R}\}$

$R = \{y \in \mathbb{R}\}$

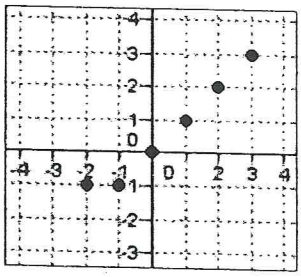
f)



$D = \{x \in \mathbb{R}\}$

$R = \{-4\}$

g)



$D = \{-2, -1, 0, 1, 2, 3\}$

$R = \{-1, 0, 1, 2, 3\}$

h) {(1, 3), (1, 4), (1, 5), (1, 6)}

$D = \{1\}$

$R = \{3, 4, 5, 6\}$

Function Notation

For functions, there is a special notation we can use.

In the past, you have written functions as $y = mx + b$ or $y = ax^2 + bx + c$.

With function notation we replace the y with f(x). = "f of x"

This notation gives more information than "y".

HW: Worksheet "Quadratics Mid-unit Review"

There are two common points of confusion among many students:

Confusion point 1:

$f(x)$ is NOT a multiplication (not f times x)

Confusion point 2:

$f(x)$ altogether means only "y" – and it is weird that there are 2 things representing 1 thing!

$f(x) = y$. ~~$f(x) = f + x$~~

Think of it this way:

$$f(x) = mx + b$$

means

$$f(\square) = m\square + b$$

$$f(x) = ax^2 + bx + c$$

means

$$f(\square) = a\square^2 + b\square + c$$

where you can put a number in the box!

Example 1

For the line $f(x) = 3x + 4$, find $f(3)$. What point is on the graph of $f(x)$?

↳ when $x = 3 \rightarrow y = ?$

$f(3) = 3(3) + 4$

$f(3) = 9 + 4$

$\therefore f(3) = 13$ $\therefore$ (3, 13) is the point on the graph.

Example 2

For the parabola $g(x) = x^2 - x - 2$ find $g(-2)$. What point is on the graph of $g(x)$?

↳ when $x = -2$, $y = ?$

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

$g(-2) = 4 + 2 - 2$

$g(-2) = 4$

$\therefore$ point is $(-2, 4)$

Example 3

Suppose that, $h(x) = -5x - 2$. For which x does $h(x) = -12$?

$y = -12 \rightarrow x = ?$

$-12 = -5x - 2$

$-12 + 2 = -5x$

$-10 = -5x$

$x = 2$

$\therefore h(2) = -12$