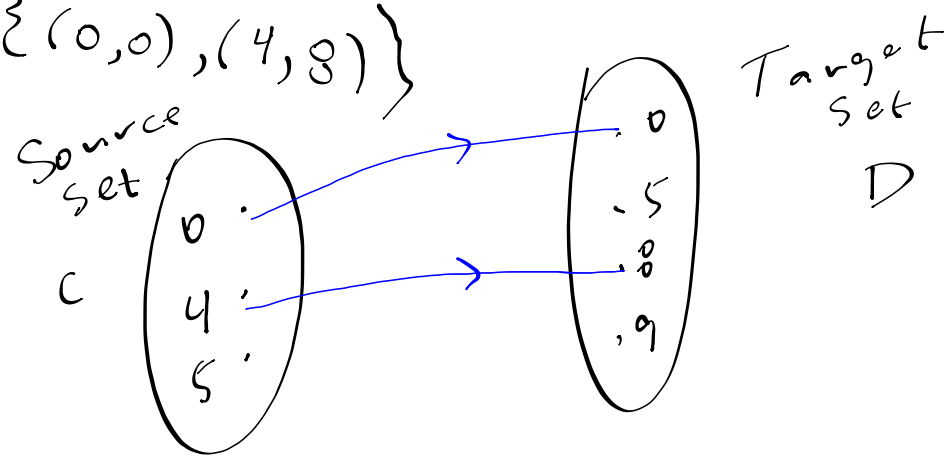
P 6.29

6.b) $R = \{(x,y) \in C \times D \mid y = 2x\}$

$C = \{0, 4, 5\}$

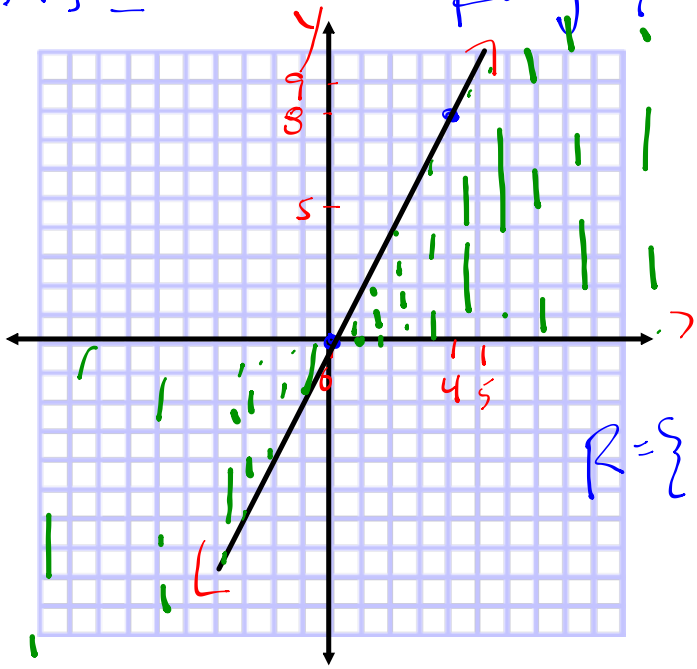
$D = \{0, 5, 8, 9\}$

$R = \{(0,0), (4,8)\}$



Domain $= \{0, 4\} \subseteq C$

Range $\{0, 8\} \subseteq D$



$D = \mathbb{R}$

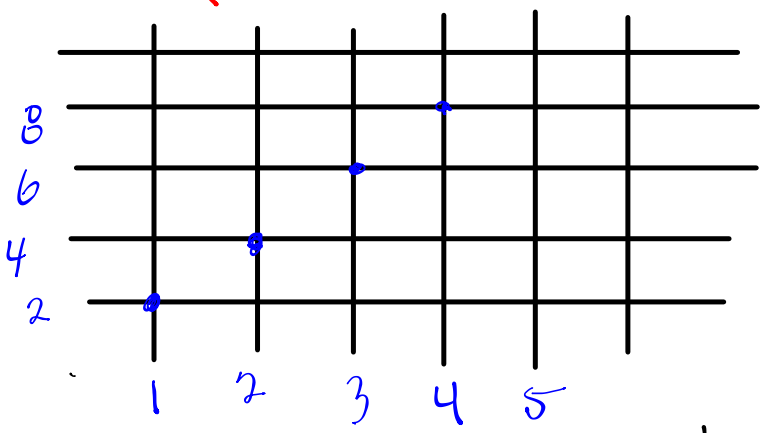
$-\infty, \infty$

$R = \{(x,y) \in \mathbb{R} \times \mathbb{R} \mid y = 2x\}$

Unit 7: Defining a Relation Using Set Builder Notation

(graph → SBN)

p72



Define R in set builder's notation

$$R = \{(x,y) \in A \times B \mid y = 2x\}$$

↳ rule (equation of correspondence) (look for the pattern)

$$A = \{x \in \mathbb{N} \mid 1 \le x \le 5\}$$

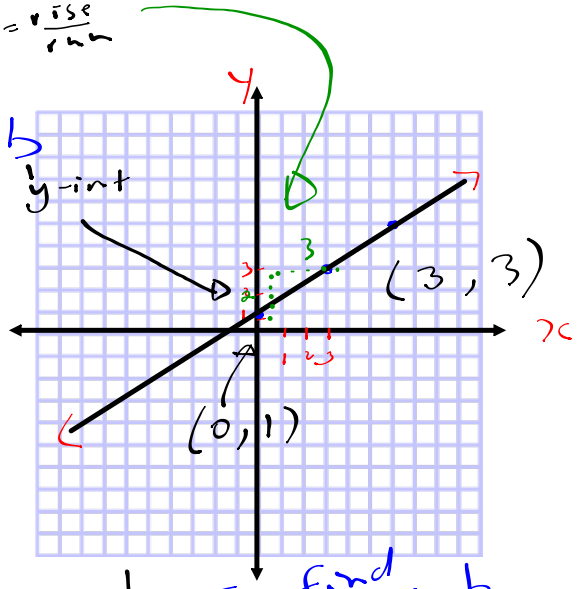
$$B = \{2, 4, 6, 8\}$$

$$B = \{y \in \mathbb{N} \mid 2 \le y \le 8 \text{ and } y \text{ is even}\}$$

Define the Relation in set builder Notation

slope = $\frac{\text{rise}}{\text{run}}$

$y = mx + b$



(because it's a solid line w/ arrows)

$R = \{(x,y) \in \mathbb{R} \times \mathbb{R} \mid y = \frac{2}{3}x + 1\}$

To find the slope

$(0, 1)$ $(3, 3)$

x_1, y_1 x_2, y_2

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{3-1}{3-0} = \frac{2}{3}$

$y = \frac{2}{3}x + b$

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

To find equation w/ b

$m = \frac{y - y_1}{x - x_1}$

$\frac{2}{3} = \frac{y-1}{x-0}$

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

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

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

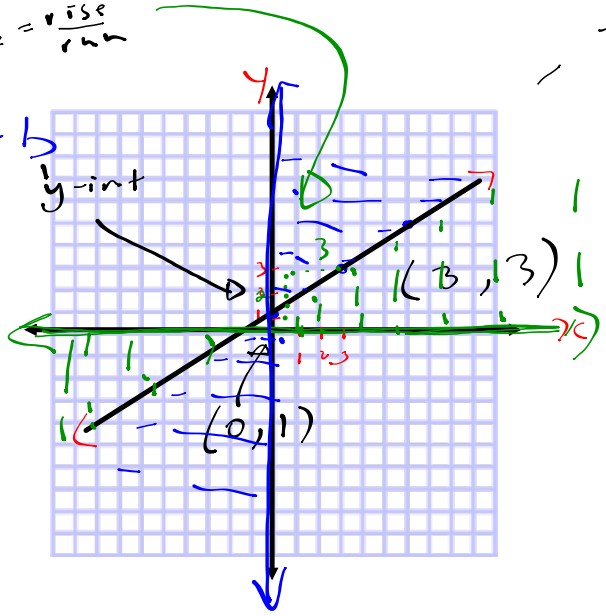
$y = \frac{2}{3}x + 1$

$R = \{(x,y) \in \mathbb{R} \times \mathbb{R} \mid y = \frac{2}{3}x + 1\}$

Domain

slope = $\frac{\text{rise}}{\text{run}}$

$y = mx + b$



Domain:

x-values the Relation uses

$]-\infty, \infty[$

Range:

y-values the relation uses

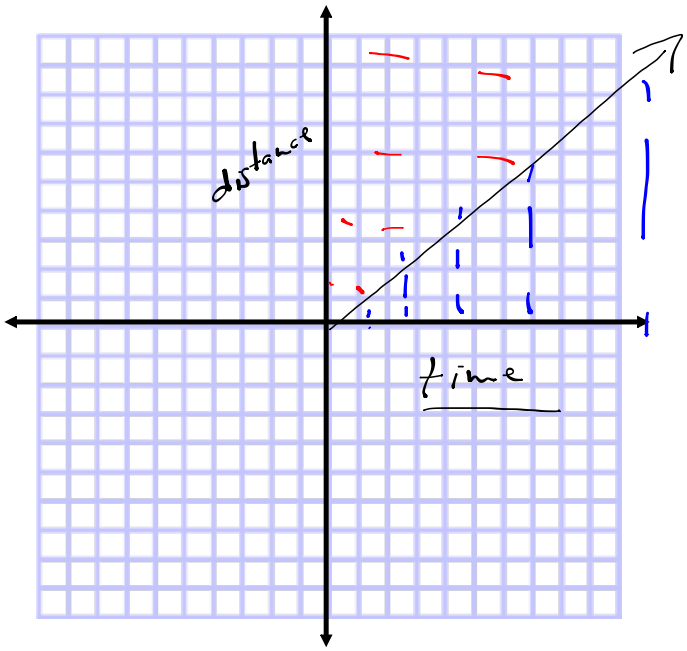
$]-\infty, \infty[$

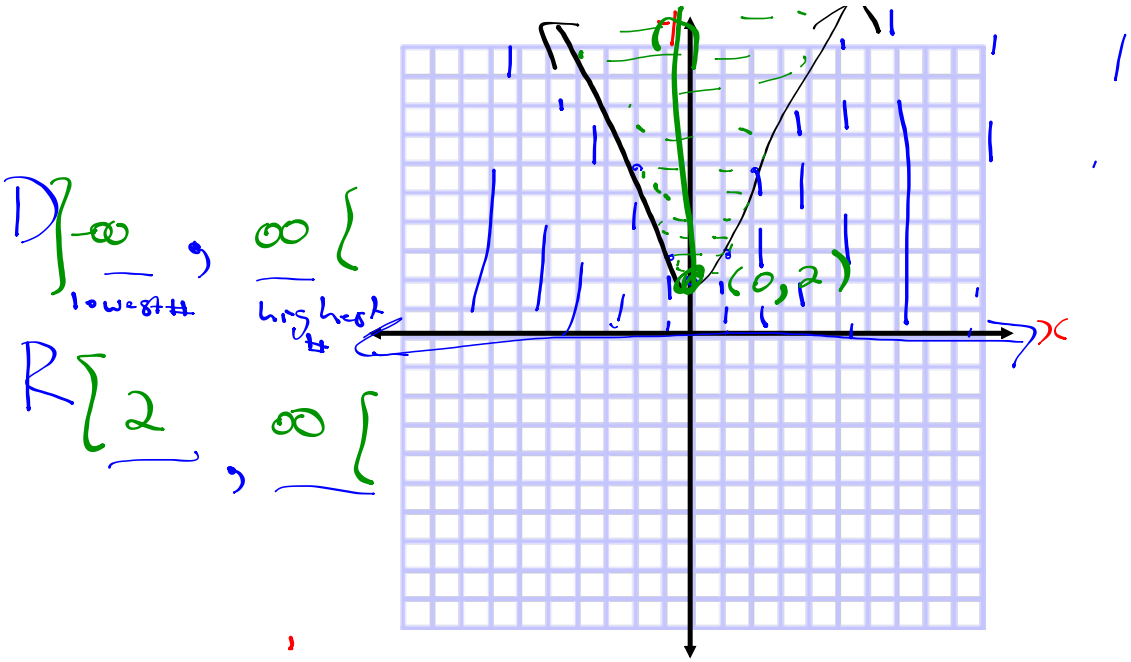
Domain

$[0, \infty[$

Range

$[0, \infty[$

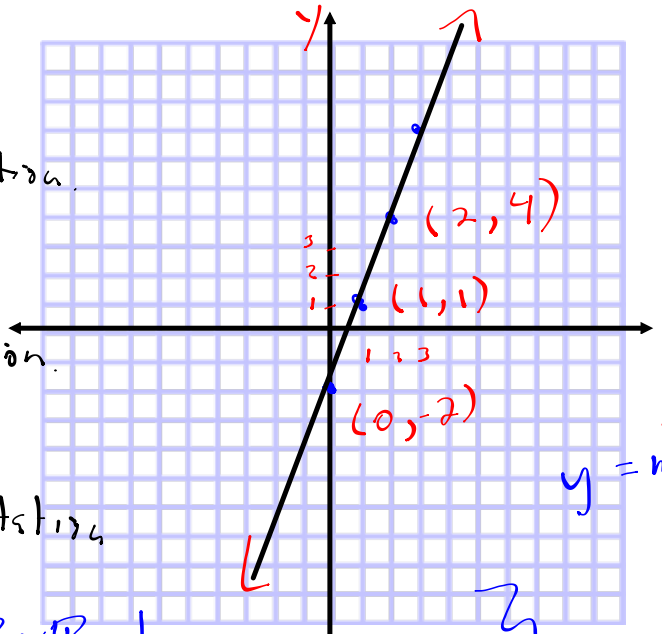



(0,2)
D]-∞ , ∞ [
lowest
highest
R [2 , ∞ [

Define R in
Set Builders Notation.

Give the Domain
in Interval Notation.

Give the Range
in Set Builder Notation



$y = mx + b$

$R = \{(x,y) \in \mathbb{R} \times \mathbb{R} \mid y = 3x - 2\}$

↳ where elements come from

↳ how elements correspond / relate to each other

$(0,-2) \quad (1,1)$
$x_1 \; y_1 \quad x_2 \; y_2$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{1-(-2)}{1-0}$

$m = 3$

finish $y = mx + b$
w/ b

$m = \frac{y - y_1}{x - x_1}$

$\frac{3}{1} = \frac{y+2}{x-0}$

$3x = y + 2$

$-2 \quad -2$

$y = 3x - 2$

Steps to define the Relation that's represented by the shaded area. → an inequality

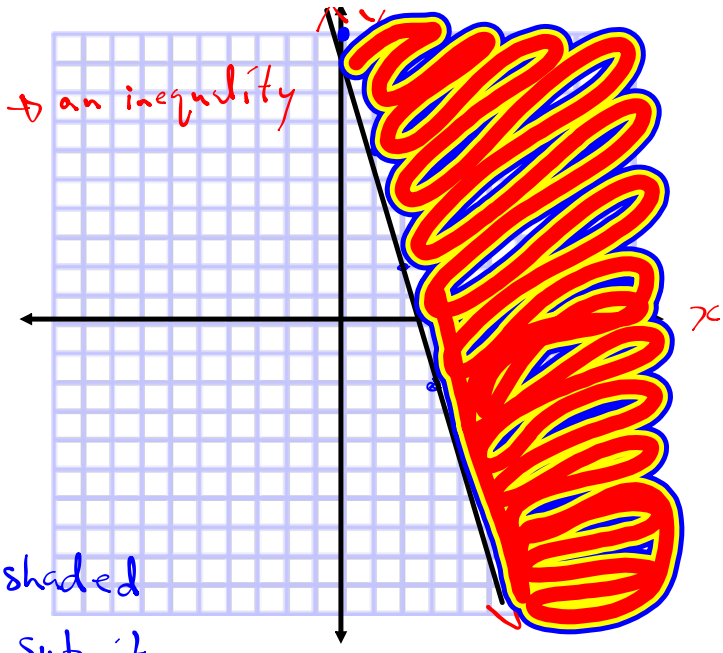
$R = \{(x,y) \ldots\ldots\}$

① Find the equation of just the line.

$(y = mx + b)$

$y = -4x + 10$

② Find the inequality by replacing the "=" with either "$\leq$" "$\geq$".



Take a point from the shaded region (not on the line), sub it into the formula, and make a true statement w "$\leq$" "$\geq$"

ex $(5,5)$

$y \overset{?}{\geq} -4x + 10$

$5 \overset{?}{\geq} -4(5) + 10$

$5 \overset{?}{\geq} -10$

$5 \geq -10$

$y \geq -4x + 10$

$R = \{(x,y) \in \mathbb{R} \times \mathbb{R} \mid y \geq -4x + 10\}$

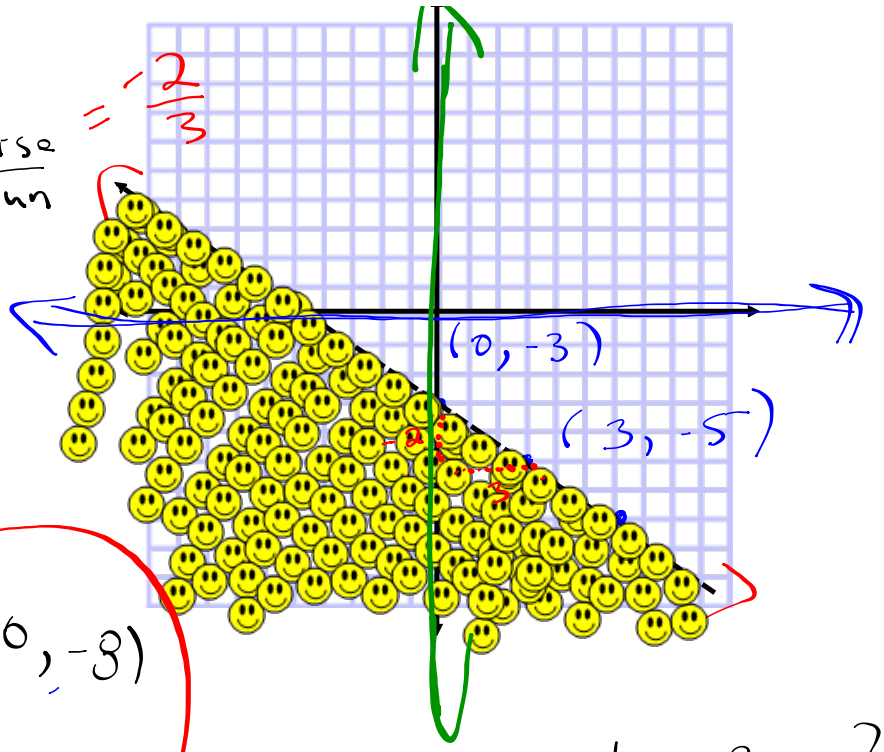
if your line was dotted $\geq$ turns into $>$.

Define the Relation in Set Builders Notation

Domain:

Range:

$m = \frac{rise}{run} = \frac{-2}{3}$



$y = mx + b$

$y = mx - 3$

$y = \frac{-2}{3}x - 3$

test point $(0, -3)$

$-3 \stackrel{?}{<} \frac{-2}{3}(0) - 3$

$-3 \stackrel{?}{<} -3$

$-3 < -3$

$R = \{(x, y) \in \mathbb{R} \times \mathbb{R} \mid y < \frac{-2}{3}x - 3\}$

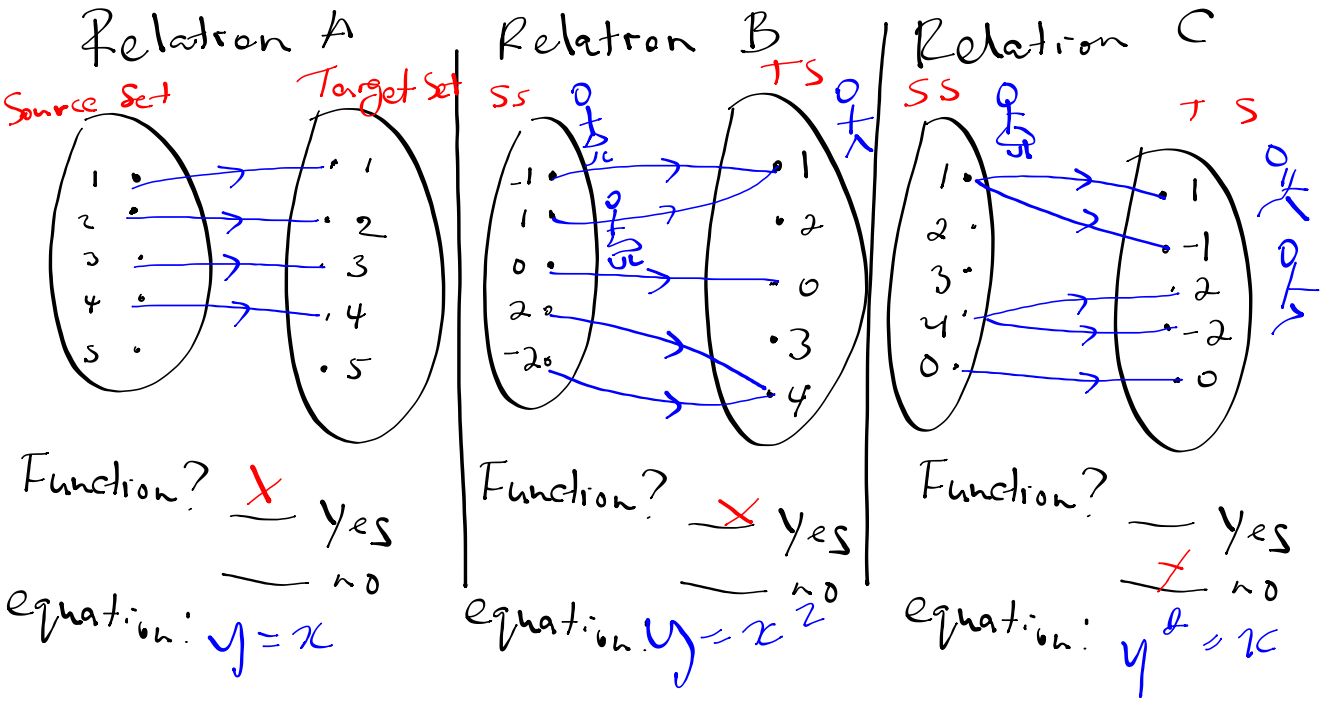
$D:]-\infty, \infty[$

$R:]-\infty, \infty($

Unit 8 : Function ;

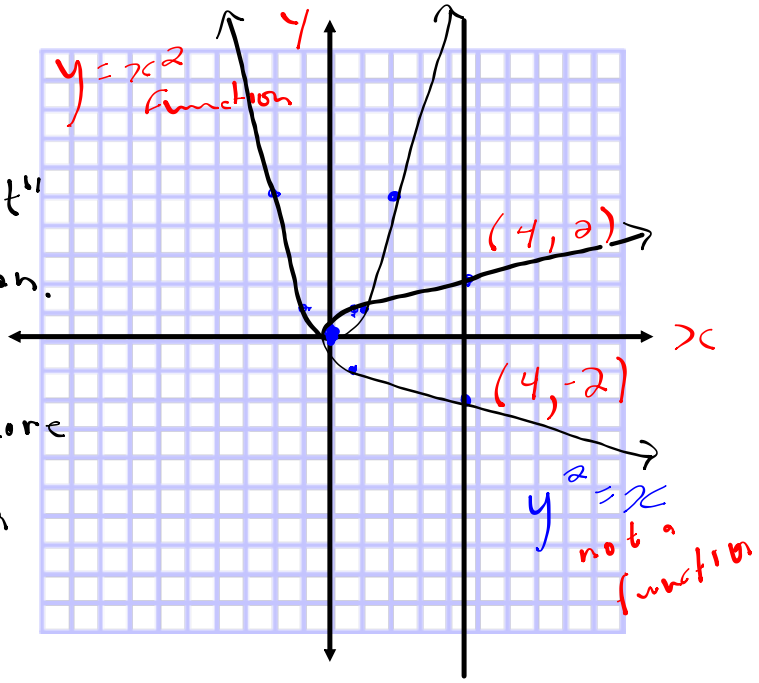
A Function is a Relation w the more condition.

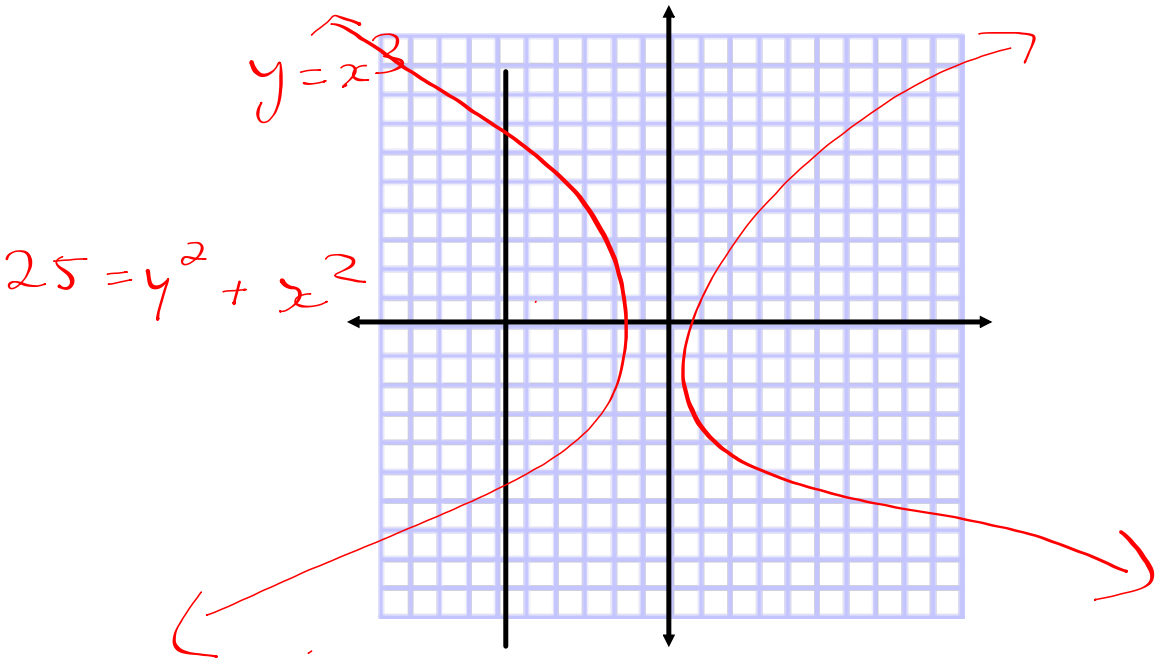
A function is a relation in which each element of the source set corresponds to only one element of the target set.


Relation A
Source Set
Target Set
1
2
3
4
5
1
2
3
4
5
Function? X
yes
no
equation: y = x
Relation B
SS
TS
-1
1
0
2
-2
1
2
0
3
4
Function? X
yes
no
equation: y = x²
Relation C
SS
TS
1
2
3
4
0
1
-1
2
-2
0
Function?
yes
X
no
equation: y = x

With a graph of a relation, apply the "vertical line test" to see if it's a function.

Draw a vertical point; if it passes through more than one point, not a function.




$y = x^3$
$25 = y^2 + x^2$

functions get their special own Notation :

Set Builders Notation

$$f = \{(x,y) \in \mathbb{R} \times \mathbb{R} \mid y = 7x - 4\}$$

Functional Notation

source set → $\mathbb{R}$; target set ← $\mathbb{R}$

$$f : \mathbb{R} \to \mathbb{R}$$

$$x \longmapsto 7x - 4$$

$\hookrightarrow = y$

For functions, you can rewrite the equation:

$y = 2x - 4$

equivalent!

$f(x) = 2x - 4$

"f at x"

the y value when x is defined.

ex. f(2)

f at 2

The value of y when $x = 2$.

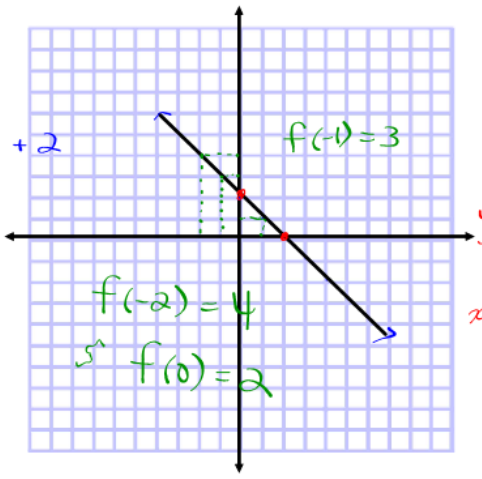
$x = 0$

$y = -4$

$f(0) = -4$

e.x.

$f(x) = -x + 2$



Find x, y

$f(1) = 1$ (1, 1)

$f(-1) = 3$ (-1, 3)

y-int $f(0) = 2$ (0, 2)

x-int $f(2) = 0$ (2, 0)

∴

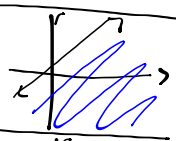
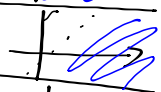
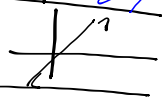
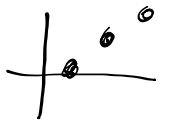
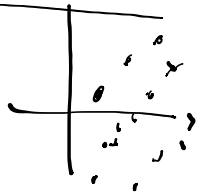
$f(0)$ = y-int

8

Convert to Set Builders Notation and graph

$$f : \mathbb{N} \to \mathbb{Z}$$

$$x \longmapsto 3x + 2$$

When there's a:	Ex	There's a:	Diagram
$\geq$	$y \geq x+2$	solid line and shading	
$>$	$y > x+2$	dotted line and shading	
$\mathbb{R}\times\mathbb{R}$ (cartesian product)	$R=\{(x,y)\in\mathbb{R}\times\mathbb{R} \mid y=x+2\}$	solid line with arrows	
$\mathbb{N}\times\mathbb{N}$ or $\mathbb{N}\times\mathbb{Z}$	$R=\{(x,y)\in\mathbb{N}\times\mathbb{N} \mid y=x+2\}$	no solid line no dotted line just plot points	
(rare) $\geq$ and $\mathbb{Z}\times\mathbb{Z}$	$R=\{(x,y)\in\mathbb{Z}\times\mathbb{Z} \mid y\geq x+2\}$	just plot points for the line and the shaded area	

Closed bracket goes w closed dot
Open bracket goes w open dot

$]2, 5]$