

EXERCISE 2.6

1. For $A = \{1, 2, 3, 4\}$ find the following relations in A . State the domain and range of each relation. Also draw the graph of each.

(i) $\{(x, y) \mid y = x\}$

$R_1 = \{(1, 1), (2, 2), (3, 3), (4, 4)\}$

Dom $R_1 = \{1, 2, 3, 4\} = A$

Range $R_1 = \{1, 2, 3, 4\} = A$

(ii) $R_2 = \{(x, y) \mid y + x = 5\}$

$R_2 = \{(1, 4), (2, 3), (3, 2), (4, 1)\}$

Dom $R_2 = \{1, 2, 3, 4\} = A$

Range $R_2 = \{1, 2, 3, 4\} = A$

(iii) $R_3 = \{(x, y) \mid x + y < 5\}$

$R_3 = \{(1, 2), (1, 3), (2, 1), (2, 2), (1, 1)\}$

Dom(R_3) = $\{1, 2, 3\}$ Range $R_3 = \{1, 2, 3\}$

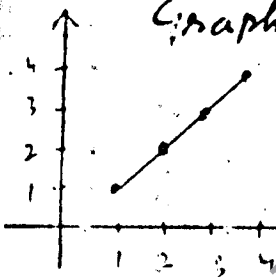
(iv) $R_4 = \{(x, y) \mid x + y > 5\}$

$R_4 = \{(2, 4), (3, 3), (4, 3), (3, 4), (4, 2), (4, 4)\}$

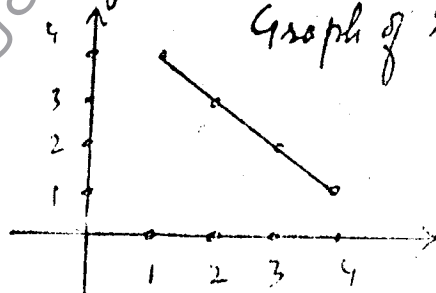
Dom $R_4 = \{2, 3, 4\}$

Range $R_4 = \{2, 3, 4\}$

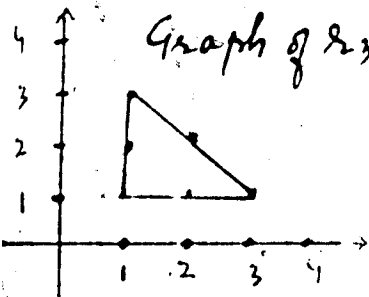
Graph of R_1



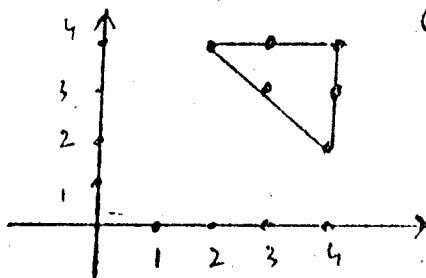
Graph of R_2



Graph of R_3



Graph of R_4



2. Repeat Q=1 when $A = \mathbb{R}$ Set of real Numbers which of the real lines are functions

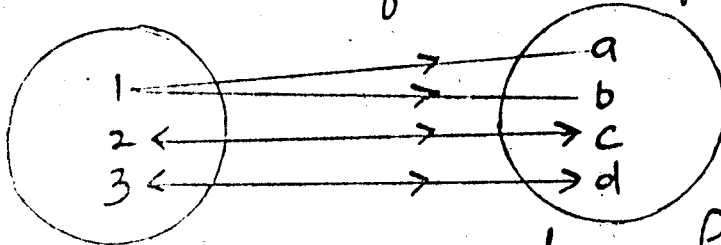
$R_1 = \{(x, y) \mid y = x\}$ is a function

$R_2 = \{(x, y) \mid x + y = 5\}$ is a function

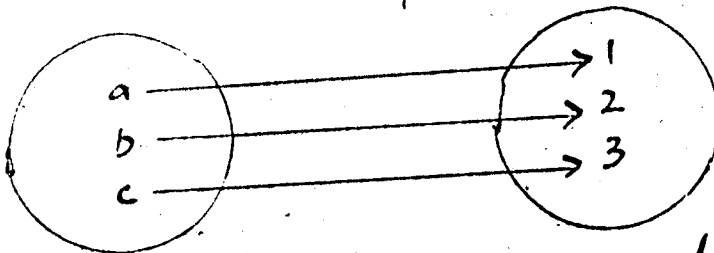
$R_3 = \{(x, y) \mid x + y < 5\}$ is not a function

because Domain is repeated

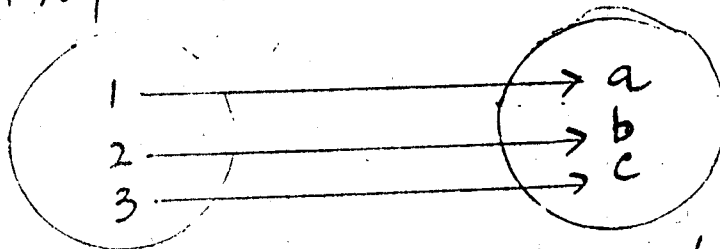
3. $R_4 = \{(x, y) \mid x+y > 5\}$ is not a function because Domain is repeated.
 which of the following diagrams represent functions and of which type.



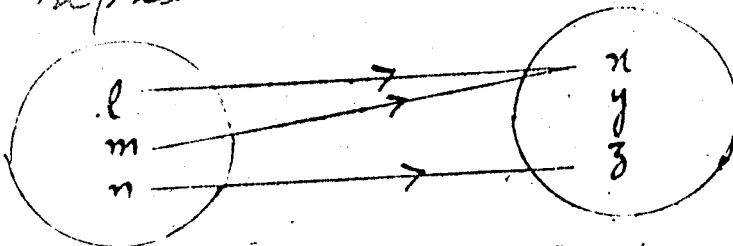
It does not represent a function.



It represents one-to-one and onto function.



It represents one-to-one and onto function.



4. It represents an injective (Into) function.
 Find the inverse of each of the following relations. Tell whether each relation and its inverse is a function or not.

(i) $R = \{(2, 1), (3, 2), (4, 3), (5, 4), (6, 5)\}$

R is a function $\text{Dom}(R) = \{2, 3, 4, 5, 6\}$

$R^{-1} = \{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6)\}$

R^{-1} is also a function with $\text{Dom}(R^{-1}) = \{1, 2, 3, 4, 5\}$

(ii) $R = \{(1, 3), (2, 5), (3, 7), (4, 9), (5, 11)\}$

R is a function $\text{Dom}(R) = \{1, 2, 3, 4, 5\}$

$R^{-1} = \{(3, 1), (5, 2), (7, 3), (9, 4), (11, 5)\}$

R^{-1} is also a function

As domain is not repeated.

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

put $x = 0, 1, 2, \dots$

$R = \{(0, 3), (1, 5), (2, 7), \dots\}$

R is a function

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

put $x = 0, 1, 2, \dots$

R^{-1} is a function

(iv) $R = \{(x, y) \mid y^2 = 4ax, x \geq 0\}$

put $x = 0, 1, 2, \dots$

$R = \{(0, 0), (1, 2\sqrt{a}), (2, \sqrt{8a}), \dots\}$

R is a function

$R^{-1} = \{(x, y) \mid y = \frac{1}{4a} x^2, x \geq 0\}$

R^{-1} is a function

(v) $R = \{(x, y) \mid x^2 + y^2 = 9, |x|, |y| \leq 3\}$

$R^{-1} = \{(x, y) \mid y^2 + x^2 = 9, |x|, |y| \leq 3\}$

R , and R^{-1} are not functions

put $x = 0, \pm 1, \pm 2, \dots$

$R = \{(0, 0), \dots\}$

As Domain is repeated.

