Assignment 01

Course Code: CSE-115

Course Title**:** Discrete Mathematics

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Department: ECSE

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Assignment: 1

12. Determine whether each of these function Z to Z is one to one.

(a) $f(n) = n-1$

Let $f(n_1) = f(n_2)$

$n_1 - 1 = n_2 - 1$

$n_1 = n_2$

This function is one to one.

(b) $f(n) = n^2+1$

Let $f(n_1) = f(n_2)$

$n_1^2 + 1 = n_2^2 + 1$

$n^2 = n_2^2$

$n_1 = \pm n_2$

This function is not one to one

(c) $f(n) = n^3$

Let $f(n_1) = f(n_2)$

$n_1^3 = n_2^3$

$n_1 = n_2$

This function is one to one

(d) $f(n) = [n/2]$

Let, $f(n_1) = f(n_2)$

$\frac{n_1}{2} = \frac{n_2}{2}$

$n_1 = n_2$

This function is one to one

(13) Which function is Exercise 12 are onto?

(a) $f(n) = n-1$

Let $n-1 = m$

$n = m+1$

This function is onto

(b) $f(n) = n^2+1$

Let $n^2+1 = m$

$n^2 = m-1$

$n = \sqrt{m-1}$

This function is not onto.

(c) $f(n) = n^3$

Let $n^3 = m$

$n = \sqrt[3]{m}$

This function is onto

(d) $f(n) = n/2$

Let $n/2 = m$

$n = 2m$

This function is onto.

(22) Determine whether each of these functions is a bijection from R to R.

(a) $f(x) = -3x+4$

check one to one

$f(x_1) = f(x_2)$

$\Rightarrow -3x_1+4 = -3x_2+4$

$\Rightarrow -3x_1 = -3x_2$

$\Rightarrow x_1 = x_2$

one to one

check onto

let, $-3x+4 = y$

$-3x = y-4$

$x = \frac{y-4}{-3}$

onto function.

These function is a bijection.

(b) $f(x) = -3x^2+7$

check one to one

$f(x_1) = f(x_2)$

$-3x_1^2+7 = -3x_2^2+7$

$-3x_1^2 = -3x_2^2$

$x_1^2 = x_2^2$

$x_1 = \pm x_2$

not one to one function

thats why These function is not a bijection.

(c) $f(x) = (x+1)/(x+2)$

Let, $\frac{x_1+1}{x_1+2} = \frac{x_2+1}{x_2+2}$

$\Rightarrow x_1x_2 + x_1 + 2x_2 + 2 = x_1x_2 + 2x_1 + x_2 + 2$

$\Rightarrow 2x_2 - x_2 = 2x_1 - x_1$

$\Rightarrow x_1 = x_2$

one to one function.

Let, $\frac{x+1}{x+2} = m$

$(x+1) = mx + 2m$

$x - mx = 2m - 1$

$x(1-m) = 2m-1$

$x = \frac{2m-1}{1-m}$

not onto.

So This function is not a bijection function.

(d) $f(x) = x^5 + 1$

Let, $f(x_1) = f(x_2)$

$x_1^5 + 1 = x_2^5 + 1$

$\Rightarrow x_1^5 = x_2^5$

$\Rightarrow x_1 = \sqrt[5]{x_2^5}$

$\Rightarrow x_1 = x_2$

one to one

Let, $x^5 + 1 = m$

$x^5 = m - 1$

$x = \sqrt[5]{m-1}$

onto function.

So this function is a bijection.

(29) Determine whether each of these is a bijection from R to R.

(a) $f(x) = 2x+1$

Let $f(x_1) = f(x_2)$

$2x_1+1 = 2x_2+1$

$2x_1 = 2x_2$

$x_1 = x_2$

one to one.

Let,

$2x+1 = m$

$2x = m-1$

$x = \frac{m-1}{2}$

onto function.

This function is bijection.

(b) $f(x) = x^2+1$

Let, $f(x_1) = f(x_2)$

$x_1^2+1 = x_2^2+1$

$x_1^2 = x_2^2$

$x_1 = \pm x_2$

not one to one

This function is not bijection

(c) $f(x) = x^3$

Let $f(x_1) = f(x_2)$

$x_1^3 = x_2^3$

$x_1 = x_2$ one to one

Let, $x^3 = m$

$x = \sqrt[3]{m}$

onto

This function is bijection.

(d) $f(x) = (x^2+1)(x^2+2)$

Let, $f(x_1) = f(x_2)$

$\frac{(x_1^2+1)}{(x_1^2+2)} = \frac{x_2^2+1}{(x_2^2+2)}$

$\Rightarrow x_1^2x_2^2 + 2x_1^2 + x_2^2 + 2 = x_1^2x_2^2 + x_1^2 + 2x_2^2 + 2$

$\Rightarrow 2x_1^2 - x_1^2 = 2x_2^2 - x_2^2$

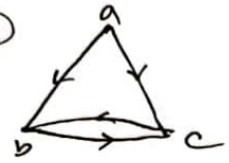
$\Rightarrow x_1^2 = x_2^2$

$\Rightarrow x_1 = \pm x_2$

This function is not bijection.

(31) (32) Determine whether the relations represented by the directed graph shown in Exercises (23–25) (26–28) are reflexive or symmetric.

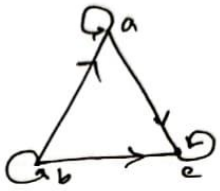
(23)



$R = \{(a,c),(a,b),(b,c),(c,b)\}$

not reflexive
not symmetric

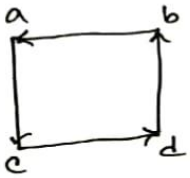
(24)



$R = \{(a,a),(b,b),(c,c),(a,c),(b,c),(b,a)\}$

reflexive but not symmetric

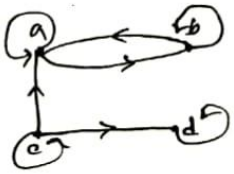
(25)



$R = \{(a,c),(c,d),(d,b),(b,a)\}$

not reflexive
Not symmetric

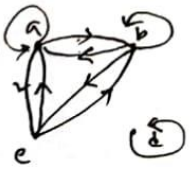
(26)



$R = \{(a,a),(b,b),(c,c),(d,d),(a,b),(b,a),(c,a),(c,d)\}$

Reflexive but not symmetric

(27)



$R = \{(a,a),(b,b),(d,d),(a,b),(b,a),(a,c),(c,a),(b,c),(c,b)\}$

Not reflexive
not symmetric

(28)

$R = \{(a,a),(b,b),(c,c),(d,d),(a,b),(b,a),(c,d),(d,c)\}$

reflexive
Symmetric.