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ASSIGNMENT DISCRETE STRUCTURE 1 (PART 2)

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ANSWERS:

1.Since Set Z is integer number, let Set Z = {1,2,3,4,5,6}

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

- Symmetric

  $\forall x,y \in Z, (x,y) \in R \rightarrow (y,x) \in R$

  Eg: There exist (1,2) and (2,1) in relation R.

- Not transitive

  $(x,y),(y,z) \in R, (x,z) \notin R$

  In relation R on set Z, (1,3), (3,1) is shown but no (1,1) available in set relation.

- Irreflexive

  $\forall x \in Z, (x,x) \notin R$

  x is not related to x

  As shown in relation to set Z, there is no (1,1) or (2,2).

- Not antisymmetric

  $\exists x,y \in Z, (x,y) \in R \rightarrow (y,x) \notin R$

  Eg: (1,3) and (3,1) $\in$ R

  So, it is not an antisymmetric relation.

- Not asymmetric

  To be asymmetric, the set of relations must be antisymmetric and irreflexive.

  For relation R on set Z, it is irreflexive but not antisymmetric. Therefore, it is not an asymmetric relation.

not reflexive

2. 5

$$M_R = \begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$$

show the matrix

-R is reflexive because the matrix of relation has 1's on the main diagonal.

-R is not symmetric because the matrix of relation MR is not equal to M_R^T

-R is not transitive because $M_R \otimes M_R \neq M_R$.

-Hence, R is not an equivalence relation.

3.a) Show that f is one to one.

Function is one to one when $\forall x_1 \forall x_2$ $((f(x_1) = f(x_2)), x_1 = x_2$.

$f(x,y) = (2x-y, x-2y)$

$(2x_1-y_1, x_1-2y_1) = (2x_2-y_2, x_2-2y_2)$

$(2x_1-y_1 = 2x_2-y_2) \times -2$

$-4x_1+2y_1 = -4x_2+2y_2$

(+) $x_1-2y_1 = x_2-2y_2$

$-3x_1 = -3x_2$

$x_1 = x_2$ 4

$2x_1-y_1 = 2x_2-y_2$

$-y_1 = -y_2$

$y_1 = y_2$

Thus, $f(x,y) = (2x-y, x-2y)$ is a one-to-one function.

b) Find f^{-1}

f(x) = 2x-y

let f(x) = n

n= 2x-y

2x = n+y

x= (n+y)/2

f^{-1}(n) = (n+y)/2

f(y) = x-2y

let f(y)= m

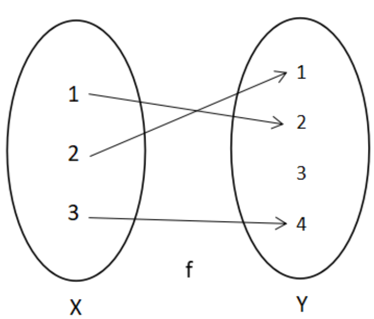
m= x-2y

m–x = -2y

y = (x–m)/2

f^{-1}(m)= (x-n)/2

4. a)



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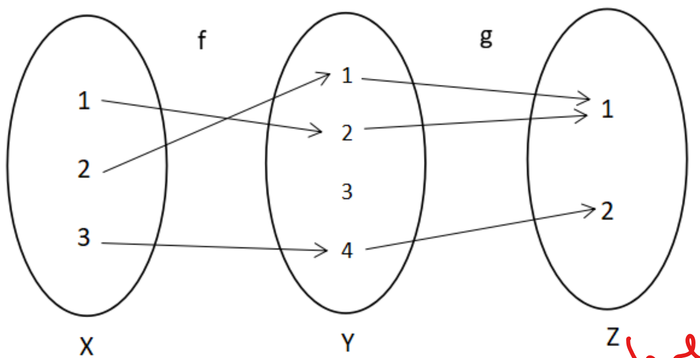
b) g(x) = {(1,1), (2,1), (3,2)}



show the steps!

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5. $f(x) = x^3$ and $g(x) = x-1$, for all real number x

$g(x^3)$

i) find $(g \circ f)$ and $(f \circ g)$

$(g \circ f) = g(f(x)) = (x^3) - 1 = x^3 - 1$

$(f \circ g) = f(g(x)) = (x-1)^3 = x^3 - 3x^2 + 3x - 1$

$f(x-1)$

ii) determine whether $g \circ f$ equals $f \circ g$:

$g \circ f = x^3 - 1$

$f \circ g = x^3 - 3x^2 + 3x - 1$

Thus, $(g \circ f) \neq (f \circ g)$.

show counter example

6.

Let a_n =the number of strings of length n in A* that do not contain 01

$a_n = a_{n-1}+1$, and assume that $a_0=1$

When n=1, $a_1 = a_{1-1}+1 = a_0+1 = 1+1=2$ A* = {1,0}

When n=2, $a_2 = a_{2-1}+1 = a_1+1 = 2+1=3$ A* = {00,01,10,11}

When n=3, $a_3 = a_{3-1}+1 = a_2+1= 3+1=4$ A* = {000,001,010,011,100,101,110,111}

When n=4, $a_4= a_{4-1}+1 = a_3+1= 4+1=5$
A*={0000,0001,0010,0011,0100,0101,0110,0111,1000,1001,1010,1011,1100,1101,1110,1111}

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A_n = 2, 3, 4, 5, 6, …...

So, $a_n=a_{n+1}+1$ when n≥1, with $a_0=1$.

a_{n-1}

7. Input = n

Output = c(n)

c (n) {

if (n=1)

return 0

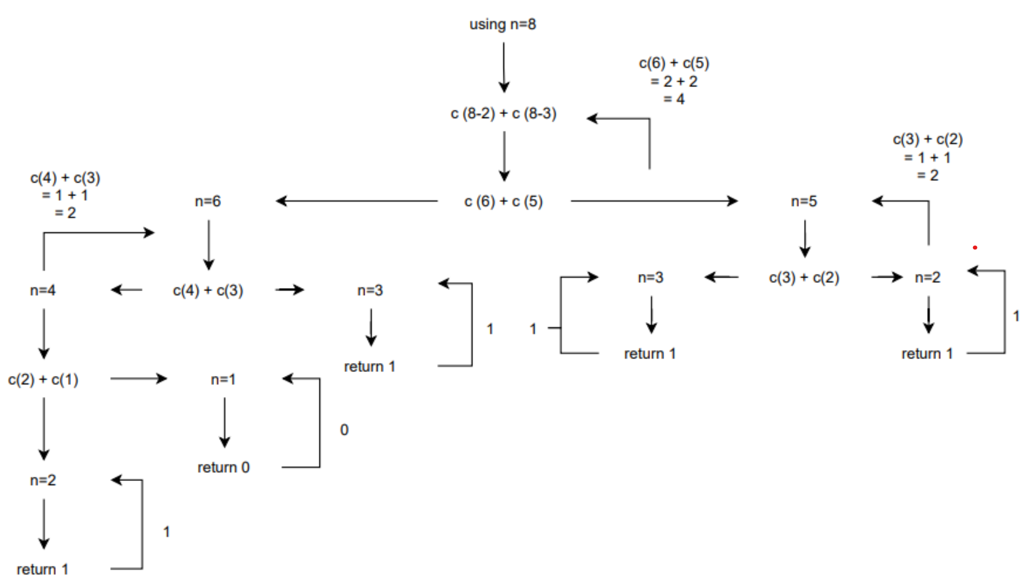
if (n=2 or n=3)

return 1

return c(n-2) +c(n-3)

}

3.



So, when n=8, c(8) =4