COMSATS University, Islamabad

Assignment # 1

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Course

Calculus ()

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ONTO Function

In onto function every element in co-domain should have a pre-image in domain. Or simply, range should be equal to co-domain. This type of function is also called **surjective function**.

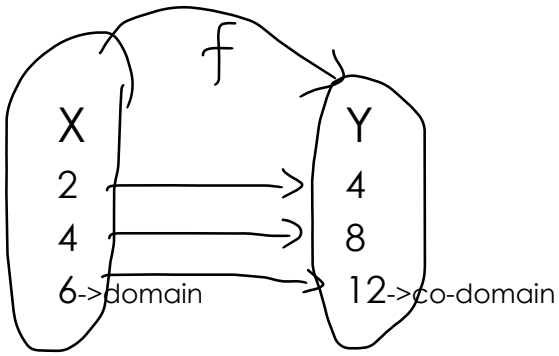
➢ Example 1

Suppose $y = f(x) = 2x$

$X = \{2, 4, 6\}$ f: R -> R

$Y = \{4, 8, 12\}$ R = (2, 4), (4, 8), (6, 12)

x	y	(x, y)
2	2(2)=4	(2,4)
4	2(4)=6	(4,8)
6	2(6)=12	(6,12)



Range = co-domain

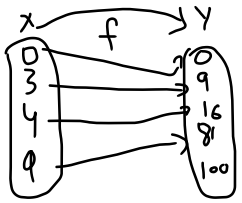
Every element in co-domain also have a pre-image in domain so it is surjective (onto) function.

➢ Example 2

$Y = f(x) = x^2$ $X = \{0,3,4,9\}$ $y = \{0,9,16,81,100\}$

F: R->R R=(0,0,),(3,9),(4,16),(9,81)

x	y	(x, y)
0	0	(0,0)
3	9	(3,9)
4	16	(4,16)
9	81	(9,81)
	100	



This function is injective as well as into and one-to-one.

INTO Function

An into function is a type of function in which atleast one element of co-domain doesn't have any pre-image in domain.

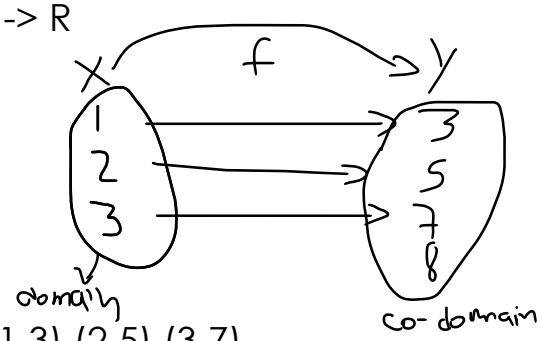
➢ Example 1

Suppose y = f(x) = 2x + 1

X={1,2,3} y={3,5,7,8}

x	y	(x, y)
1	2(1)+1=3	(1,3)
2	2(2)+1=5	(2,5)
3	2(3)+1=7	(3,7)

f: R -> R



R=(1,3),(2,5),(3,7)

As 8 doesn't have any pre-image in domain, so this type of function is called as into function.

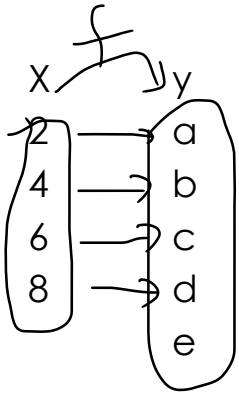
Bijective Function

A function which is both surjective and injective is termed as bijective function, e.g. every element in co-domain should have a image in domain and every element of co-domain is the image of at most one element of its domain.

➢ Examples

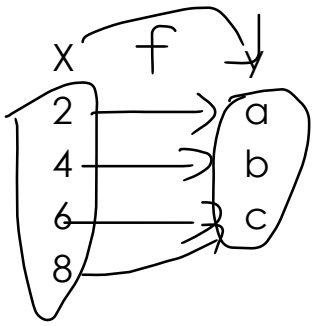
1. **<u>Injective:</u>**

X={2,4,6,8} y={a,b,c,d,e} R={(2,a),(4,b),(6,c),(8,d)}



2. **Surgective:**

X={2,4,6,8} y={a,b,c} R={(2,a),(4,b),(6,c),(8,c)}



3. **Bijective:**

X={a,b,c,d} y={1,2,3,4} R={(a,1),(b,2),(c,3),(d,4)}