MATHS CLASS XII (Relations and Functions) Continuation......

General direction for the students :-Whatever be the notes provided , everything must be copied in the Maths Copy and then do the Home work in the same Copy.

TYPES OF FUNCTIONS

1. One-One Function (Injective)

A function $f: X \rightarrow Y$ is said to be one-one function , if all the elements of X having different images in Y.

To Prove one-one ,

if $x_1 \neq x_2 \Rightarrow f(x_1) \neq f(x_2)$, $\forall\, x_1, x_2 \epsilon X$

$or \quad f(x_1) = f(x_2) \Rightarrow x_1 = x_2$, $\forall\, x_1, x_2 \epsilon X$

2. Many-One function

A function $f: X \rightarrow Y$ is said to be Many-one function , iff two or more elements of X have same image in Y.

3. Onto function (Surjective)

A function $f: X \rightarrow Y$ is said to be Onto function , iff each elements of Y is the image of atleast one element of X. Here Codomain of f = Range of f.

To Prove f is Onto ,

either $for\ every\ y \epsilon Y$, $there\ exists\ atleast\ one\ x \epsilon X\ such\ that\ y = f(x)$ or $f(X) = Y$.

4. Into function

A function $f: X \rightarrow Y$ is said to be Into function , iff there exist atleast one element of Y which is not the image of any element of X. Here Range of f is a proper subset of Codomain.

5. One-One correspondence (Bijective)

A function $f: X \rightarrow Y$ is said to be Bijective function , iff f is both One-one and Onto.

6. Identity function on set A (I_A)

A function $f: A \rightarrow A$ is said to be Identity function, if $f(x) = x \quad \forall\ x \epsilon A$.

7. Constant function

A function $f: A \rightarrow B$ is said to be Constant function $f(a) = b \quad \forall\ a \epsilon A\ and\ b\ is\ fixed\ in\ B$.

8. Equal function

Two functions $f\ and\ g$ are equal if $(i)\ D_f = D_g \qquad (ii)\ f(x) = g(x) \quad \forall\, x \epsilon D_f\ or\ D_g$.

9. Types of Monotonic function

(i) Increasing function

If a function f *is an increasing function*, *if* $x_1 < x_2 \Rightarrow f(x_1) \leq f(x_2) \quad \forall\ x_1, x_2 \in D_f$.

(ii) Strictly Increasing function

If a function f *is an strictly increasing function*, *if* $x_1 < x_2 \Rightarrow f(x_1) < f(x_2) \quad \forall\ x_1, x_2 \in D_f$.

(iii) Decreasing function

If a function f *is a decreasing function*, *if* $x_1 > x_2 \Rightarrow f(x_1) \geq f(x_2) \quad \forall\ x_1, x_2 \in D_f$.

(iv) Strictly Decreasing function

If a function f *is a strictly decreasing function*, *if* $x_1 > x_2 \Rightarrow f(x_1) > f(x_2) \quad \forall\ x_1, x_2 \in D_f$.

**A strict monotonic function is always one-one.

10. Even and Odd function

If a function f *is an* Even function $iff \quad f(-x) = f(x) \quad \forall\, x \in D_f$.

If a function f *is an* Odd function $iff \quad f(-x) = -f(x) \quad \forall\, x \in D_f$.

RESULTS

1.. *If A and B are non − empty finite sets containig m and n elements respectively, then*

i) the number of functions from A *to* B *is* n^m .

ii) the number of One-One functions from A to B is

(a) $nP_m \quad , if\ \ m \leq n$.

(b) 0 $\quad , if\ \ m > n$.

iii) the number of Onto functions from A to B is

(a) $\sum_{r=1}^{n} (-1)^{n-r}.\, nC_r.\, r^m \quad , if\ \ n \leq m$.

(b) 0 $\quad , \quad n > m$.

Particular cases

(a) $\boldsymbol{If\ n = 2\ and\ m \geq 2\ , then\ the\ number\ of\ Onto\ functions\ from\ A\ to\ B\ is\ \ 2^m - 2.}$

(b) $\boldsymbol{If\ n = 3\ and\ m \geq 3\ , then\ the\ number\ of\ Onto\ functions\ from\ A\ to\ B\ is\ 3^m - 3(2^m - 1).}$

iv) the number of One-One Onto functions from A to B is

(a) $(m)! \quad , if\ \ m = n$.

(b) 0 $\quad , \quad if\ m \neq n$.