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.

INVERTIBLE FUNCTIONS

$Let\ f : A \to B\ be\ one\ one\ and\ onto\ function\ and\ if\ f(x) = y\ \ where\ x\ \epsilon\ A\ , y \epsilon B\quad then$

$f^{-1} : B \to A\ defined\ by\ f^{-1}(y) = x\ \ is\ called\ an\ inverse\ function\ of\ f.$

Results

i) Domain of $f^{-1} = Range\ of\ f.$

ii) Range of f^{-1} = Domain of f.

iii) $f^{-1}(y) = x \quad iff\ \ f(x) = y\ \ where\ x\ \epsilon\ A\ , y \epsilon B$

Properties of inverse functions.

1. Inverse of a bijective function is unique.

2. $(f^{-1})^{-1} = f$

3. $if\ f : A \to B\ is\ bijective\ , then\ \ (i)\ f^{-1}of = I_A \qquad (ii)\ fof^{-1} = I_B$

Means Composition of a function and its inverse is Identity function.

4. $(gof)^{-1} = f^{-1}og^{-1}$

*** *Watch the video for the explanation of above notes.*

Exercise 1.5

5. Given $f\ ; R \to R\ ,\ \ f(x) = 4x + 5$

For one one

Let $x\ , y\ belongs\ to\ its\ domain$ such that $f(x) = f(y)$

$\Rightarrow 4x + 5 = 4y + 5$

$\Rightarrow x = y$

$\Rightarrow f\ is\ one\ one$

For Onto

Given Codomain=R also Given $x \epsilon R$

$\Rightarrow$ y= $4x + 5 \in R$ $\Rightarrow y \in R$

Range of f = codomain of f

$\Rightarrow$ f is onto

$\Rightarrow$ f is Invertible.

Given y= $4x + 5 \Rightarrow x = \frac{y - 5}{4} \Rightarrow f^{-1}(y) = \frac{y - 5}{4}$

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18. Given $f : R - \left\{-\frac{3}{5}\right\} \to R - \left\{\frac{2}{5}\right\}$ defined by $f(x) = \frac{2x}{5x + 3}$

For one one , $Let\ x_1, x_2 \in D_f$ such that $f(x_1) = f(x_2)$

$\Rightarrow \frac{2x_1}{5x_1 + 3} = \frac{2x_2}{5x_2 + 3}$

$\Rightarrow 10x_1x_2 + 6x_1 = 10x_1x_2 + 6x_2 \Rightarrow x_1 = x_2 \Rightarrow$ f is one one.

For onto , Codomain= $R - \left\{\frac{2}{5}\right\}$

Given $y = \frac{2x}{5x + 3} \Rightarrow 5xy + 3y = 2x \Rightarrow x = \frac{3y}{2 - 5y}$

$\Rightarrow$ Range = $R - \left\{\frac{2}{5}\right\}$ =Codomain

$\Rightarrow$ f is onto.

$\Rightarrow$ f is Invertible.

For inverse , $x = \frac{3y}{2 - 5y}$

$\Rightarrow f^{-1}(y) = \frac{3y}{2 - 5y}$

HOME WORK : Left over questions from the exercise.