

②  $R \rightarrow R$   
 $(f+g) \circ h = f \circ h + g \circ h$

$\Rightarrow (f+g)h(x)$

$\Rightarrow f h(x) + g h(x)$

$\Rightarrow f \circ g + g \circ h \longrightarrow$  Hence proved!!

LHS = RHS

③ (ii)  $f(x) = |x|$  and  $g(x) = |5x-2|$

~~fog~~  $f \circ g \Rightarrow f(g(x))$   
 $f(|5x-2|)$

$\Rightarrow |5x-2|$      $||5x-2||$   
 $\Rightarrow |5x-2|$

$g \circ f \Rightarrow g(f(x))$   
 $g(x)$

$|5|x|-2|$

(ii)  $f(x) = 8x^3$  and  $g(x) = x^{1/3}$

$g \circ f \Rightarrow g(f(x))$   
 $g(8x^3)$

$\Rightarrow (8x^3)^{1/3}$

$\Rightarrow \{(2x)^3\}^{1/3} \Rightarrow \underline{2x}$

$$\begin{aligned}
 f \circ g &\Rightarrow f(g(x)) \\
 &\Rightarrow f(x^{1/3}) \\
 &= 8(x^{1/3})^3 \\
 &= \underline{8x} \text{ Any}
 \end{aligned}$$

(4)  $f(x) = \frac{4x+3}{6x-4}, x \neq \frac{2}{3}$

Show that  $f \circ f(x) = x$ . What is inverse of  $f$ ?

$$f \circ f(x) = x$$

$$\Rightarrow \frac{4 \left( \frac{4x+3}{6x-4} \right) + 3}{6 \left( \frac{4x+3}{6x-4} \right) - 4}$$

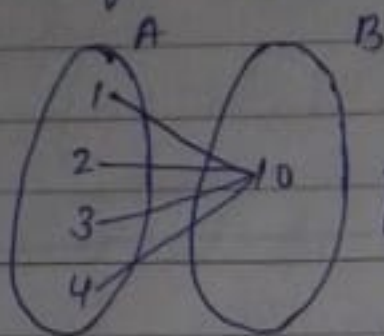
$$= \frac{4 \left( \frac{4x+3 + 3(6x-4)}{6x-4} \right)}{6 \left( \frac{4x+3 - 4(6x-4)}{6x-4} \right)}$$

$$\Rightarrow \frac{16x + 12 + 18x - 12}{24x + 18 - 24x + 16}$$

$$\Rightarrow \frac{16x + 18x}{18 + 16} \Rightarrow \frac{34x}{34} \Rightarrow \underline{x}$$

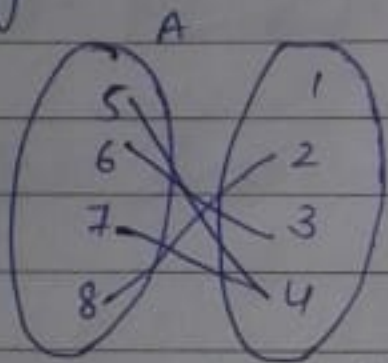
Hence, inverse of  $f$  is  $x$ .

⑤ (i)  $f: \{1, 2, 3, 4\} \rightarrow \{10\}$   
 $f = \{(1, 10), (2, 10), (3, 10), (4, 10)\}$ .



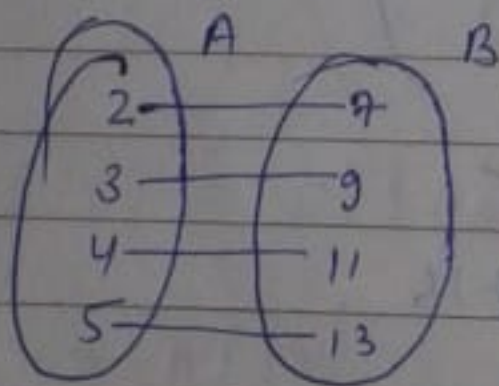
Here, It is not <sup>one-one</sup> onto function.  
 for Inverse, the function should be bijective.  
 so, It does not have Inverse.

(ii)  $g: \{5, 6, 7, 8\} \rightarrow \{1, 2, 3, 4\}$   
 $g = \{(5, 4), (6, 3), (7, 4), (8, 2)\}$ .



Here, It is not one-one function and It is not onto function because Range  $\neq$  co domain  
 for Inverse, the function should be bijective.  
 so, It does not have Inverse.

(iii)  $h: \{2, 3, 4, 5\} \rightarrow \{7, 9, 11, 13\}$   
 $h = \{(2, 7), (3, 9), (4, 11), (5, 13)\}$ .



Here, It is one-one function. Domain set is all paired.  
 Here, It is onto function  $\Rightarrow$  Range = co-domain.  
 for Inverse, the function should be bijective.  
 Hence, It is bijective  
 so, It have Inverse of functions.

⑥  $f = [-1, 1] \rightarrow \mathbb{R}$   
 $f(x) = \frac{-x}{(x+2)}$  is one-one.

find Inverse  $f: [-1, 1] \rightarrow \text{Range } f$ .

$$f(x) = \frac{-x}{(x+2)}$$

$$\Rightarrow y = \frac{-x}{x+2}$$

$$x = -y(x+2)$$

$$x = -yx - 2y$$

$$yx - x = -2y$$

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

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

$$\therefore g(y) = \frac{2y}{1-y}$$

$$f \circ g = f(g(y))$$

$$= f\left(\frac{2y}{1-y}\right)$$

$$= \frac{-\frac{2y}{1-y}}{\frac{2y}{1-y} + 2}$$

$$= \frac{-2y}{1-y} \cdot \frac{1-y}{1-y+2(1-y)}$$

$$\Rightarrow \frac{-2y}{1-y} \Rightarrow \frac{-2y}{1-y} \Rightarrow \frac{-2y}{1-y}$$

Here

$$f \circ g = y$$