

روزنامه جبهه ملی ایران
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$$f(x) = \begin{cases} x^3 - \varepsilon & ; x > a \\ 12x - 20 & ; x \leq a \end{cases} \quad (1)$$

$$a^3 - \varepsilon > 12a - 20 \Rightarrow a^3 - 12a + 19 > 0 \Rightarrow (a-2)(a^2 + 2a - 1) > 0 \\ \Rightarrow (a-2)(a-2)(a+2) > 0 \Rightarrow \frac{-2 \pm \sqrt{4+4}}{-1 \pm 1} \Rightarrow (-2, 2) \cup (2, +\infty)$$

$$f(x) = 3x + 12 \quad (2)$$

$$f^{-1}(2) = \varepsilon \Rightarrow f(\varepsilon) = 2 \Rightarrow 12 + 1\varepsilon = 2 \Rightarrow 1\varepsilon = -10 \Rightarrow f(x) = 3x - 10$$

$$\text{ii)} f(v) = 21 - 10 = 11$$

$$\Rightarrow f(f(x)) = 3(3x - 10) - 10 = 9x - 40$$

$$f(x) = \frac{ax}{x-1} \Rightarrow x = \frac{ay}{y-1} \Rightarrow xy - x = ay \Rightarrow y(a-x) = -x \quad (3)$$

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

$$f = \{(3, 2), (1, 2), (2, 1), (1, 1)\} \quad g = \{(1, 2), (2, 1), (1, 1)\} \quad (4)$$

$$\text{ii)} f \circ f^{-1} = \{(2, 2), (1, 2), (2, 1), (1, 1)\}$$

$$\Rightarrow f^{-1} \circ f = \{(2, 2), (1, 2), (2, 1), (1, 1)\}$$

$$\text{ii)} f \circ g^{-1} = \{(2, 2), (2, 1)\}$$

$$\Rightarrow g^{-1} \circ f = \{(2, 2), (1, 2), (2, 1)\}$$

$$f = \{(2, \epsilon) (\epsilon, 0) (\epsilon, 1)\} \quad g = \{(2, 1) (\epsilon, 3) (\epsilon, \omega)\} \quad \textcircled{A}$$

$$h = \{(1, 2) (3, \epsilon) (\omega, 1) (\epsilon, 1)\}$$

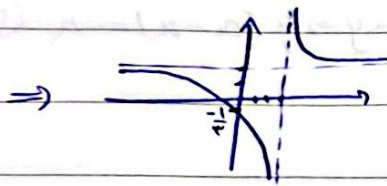
$$\Rightarrow g^{-1} = \{(1, 2) (3, \epsilon) (\omega, 1)\} \Rightarrow f \circ g^{-1} = \{(1, \epsilon) (\omega, 0) (3, 1)\}$$

$$\Rightarrow \frac{h}{f \circ g^{-1}} = \{(1, \frac{2}{\epsilon}) (\omega, \frac{1}{\epsilon}), (3, \frac{\epsilon}{1})\} \Rightarrow \{(1, \frac{2}{\epsilon}) (3, \frac{\epsilon}{1})\}$$

$\text{ex: } \frac{1}{\epsilon}$

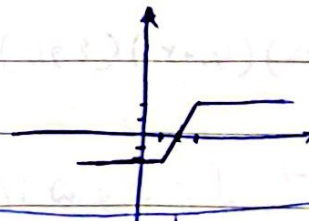
$$y = \frac{3x+1}{x-2} \Rightarrow \text{Graph} \quad \textcircled{B}$$


$$x = \frac{3y+1}{y-2} \Rightarrow xy - 2x = 3y + 1 \Rightarrow y(x-3) = 2x+1 \Rightarrow y = \frac{2x+1}{x-3}$$



$$f(x) = |x-1| - |x-3|$$

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

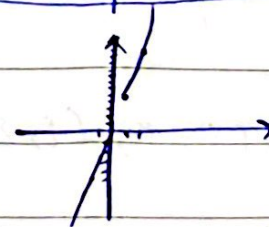


$$f(x) = \begin{cases} x^3 + 2 & ; x \geq 1 \\ 2x - 1 & ; x \leq 0 \end{cases} \quad \begin{matrix} y' = 3x^2 & 2 \\ y' = 2 & -1 \end{matrix}$$

$$\Rightarrow f^{-1}(x) = \begin{cases} \sqrt[3]{x-2} & ; x \geq 0 \\ \frac{x+1}{2} & ; x \leq 1 \end{cases}$$

$$y^3 = x - 2 \Rightarrow y = \sqrt[3]{x-2}$$

$$\Rightarrow 2y = x + 1 \Rightarrow y = \frac{x+1}{2}$$



$$f(x) = x^r \cdot \frac{x^r + 1 + rx^r + rx}{x+r} = \frac{x^r + rx^r - x^r - 1 - rx - rx^r}{x+r} \quad (9)$$

$$\Rightarrow \frac{-rx-1}{x+r} \Rightarrow x = \frac{-ry-1}{y+r} \Rightarrow xy + rx = -ry - 1 \Rightarrow y(x+r) = -rx-1$$

$$\Rightarrow y(x+r) = -rx-1 \Rightarrow y \left(\frac{-rx-1}{x+r} \right) \times \frac{1}{r} \times r = \frac{-rx-1}{x+r}$$

$$\Rightarrow b = -r \Rightarrow f^{-1}(-r) = \frac{-1}{1} \omega$$

$$f(x) = \frac{x}{x^r+1} \quad x = \frac{y}{y^r+1} \Rightarrow xy^r + x = y \quad (10)$$

$$xy^r - y + x = 0 \Rightarrow y = \frac{1 \pm \sqrt{1-4x^r}}{2x^r}$$