

①

$$f(x) = \begin{cases} x^3 - 2 & x > a \\ 12x - 20 & x \leq a \end{cases} \quad \begin{aligned} &x^3 - 12x + 14 \leq 0 \longrightarrow \\ &(a-2)^2(a+2) > 0 \\ &a \geq -2 \end{aligned}$$

$f^{-1}(2) \leq 2 \rightarrow f(2) \leq 2 \quad |2 + K \leq 2 \quad K \leq -10$ ②

$f(x) = 3x - 10 \quad f(v) = 3(v) - 10 \leq 11$ (الف)

$f(f(x)) \rightarrow 3(3x - 10) - 10 \leq 9x - 40$ (ب)

$y = \frac{ax}{x-1} \rightarrow x = \frac{ay}{y-1} \quad xy - x = ay$ (عل)

$y(x-a) \leq x \rightarrow y = \frac{x}{x-a}$
 $a = \frac{ra}{ra-a} \rightarrow a \leq r$

$g^{-1} \rightarrow f, x \text{ جایی} = \{(2, 3), (4, 8), (9, 9)\}$ ④

$f^{-1} \rightarrow \{(9, 2), (7, 4), (2, 5), (4, 9)\}$

$f \circ f^{-1} = \{(7, 7), (9, 9), (2, 2), (4, 4)\}$ (الف)

$f^{-1}(f(x)) = \{(2, 3), (4, 8), (9, 9)\}$ (ب)

$f(g^{-1}(x)) = \{(2, 9), (9, 4)\}$ (ج)

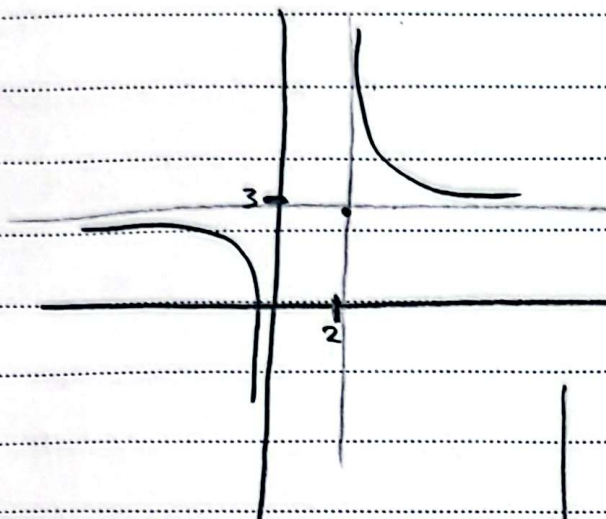
$g^{-1}(f(x)) = \{(2, 9), (7, 3), (9, 8)\}$ (د)

$g^{-1} = \{(1, 2), (3, 4), (9, 6)\} \xrightarrow{\text{جواب}} \frac{k}{f(g^{-1}(x))}$ ⑤

$\{(1, 4), (3, 8), (9, 0)\} \quad \{(1, \frac{1}{4}), (3, \frac{1}{8})\}$

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

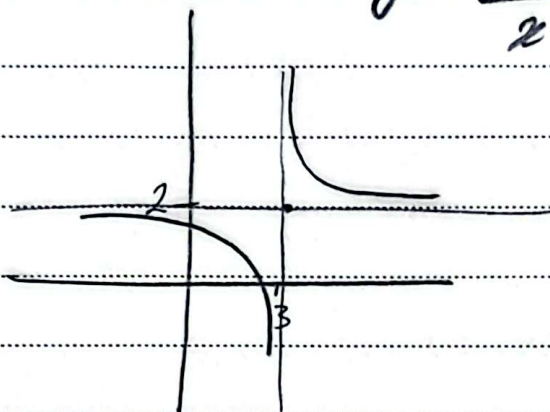
④ تابع معکوس $\leftarrow$ یک به یک $\leftarrow$ معکوس پذیر



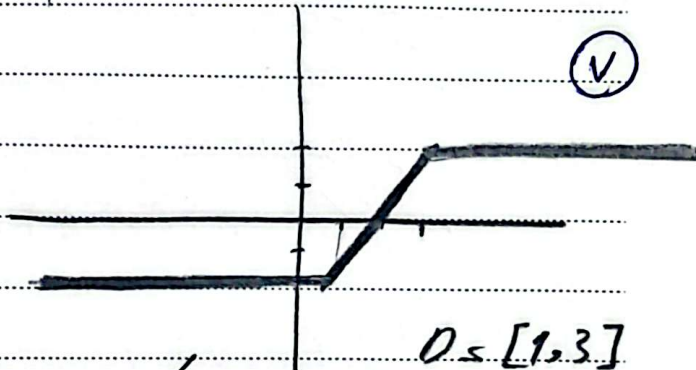
$$x = \frac{2y+1}{y-2}$$

$$y(x-2) = 2x+1 \rightarrow$$

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



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- $$\begin{cases} 1) \quad 2 & x \geq 3 \\ 2) \quad 2x-2 & 1 \leq x \leq 3 \\ 3) \quad -2 & x < 1 \end{cases}$$



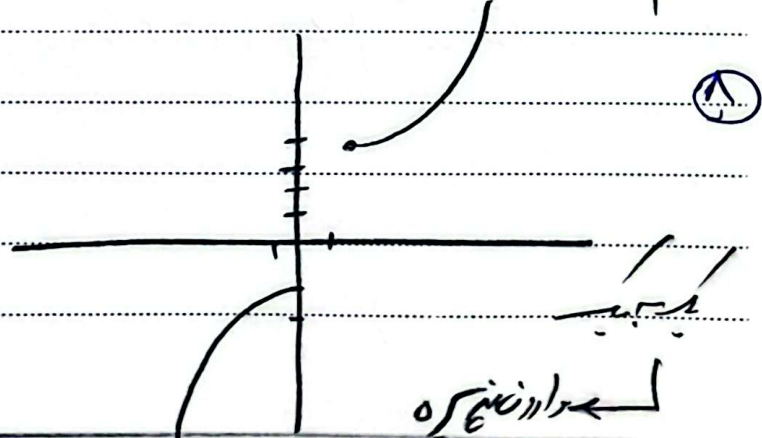
$$D = [1, 3]$$

معکوس پذیر $\leftarrow$ یک به یک $\leftarrow$ معکوس پذیر

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

- $$\begin{cases} x+2 & x \geq 1 \\ 2x-1 & x \leq 0 \end{cases}$$



$$y = x^3 + 4 \rightarrow x \geq 1 \quad R_f = [\infty, +\infty)$$

$$x = y^3 + 4 \rightarrow y \geq 5 \quad y^3 = x - 4, y = \sqrt[3]{x-4}$$

$$y \geq 5 \quad y = 4x - 1 \rightarrow R_f = (-\infty, -1]$$

$$x = 4y - 1 \quad y \leq -1 \quad x + 1 = 4y$$

$$y = \frac{x+1}{4} \rightarrow y \leq -1$$

$$\begin{aligned} \text{والب} &\Rightarrow \sqrt[3]{x-4} \quad x \geq 5 \\ &\Rightarrow \frac{x+1}{4} \quad x \leq -1 \end{aligned}$$

$$\frac{x^3 + 3x^2 - x^3 - 1 - 3x - 3x^2}{x+3}$$

$$y = \frac{-2x-1}{x+3}$$

(9)

$$xy + 3y = -1 - 3x \rightarrow x(y+3) = -3y-1$$

$$y^{-1} = \frac{-3x-1}{x+3} \rightarrow y^{-1} = \frac{-2x-2}{2x+6} \quad \begin{aligned} &\text{a) } x \rightarrow b \rightarrow -2 \\ &\text{c) } x \rightarrow d \rightarrow +6 \end{aligned}$$

$$f^{-1}(-1) \rightarrow \frac{y-1}{-1+3} = \frac{\infty}{1} = \infty$$

$$yx^2 - x + y = 0 \rightarrow [-1, 1] \cap D, \left[\frac{1}{y}, \frac{1}{y}\right] = R \quad (10)$$

$$[-1, 1] \subset R, \left[\frac{1}{y}, \frac{1}{y}\right] \subset D \leftarrow f^{-1}$$

$$yx^2 + y - x = 0$$

$$\frac{1 \pm \sqrt{1-4y^2}}{2y} = x$$

$$\Delta = b^2 - 4ac = 1 - 4y^2$$

$$(والب) y, x \text{ کلا } y \neq 0$$

$$1 \pm \sqrt{1-4x^2}$$

$$= y^{-1} \quad x \neq 0$$

$$f^{-1}(y) = \frac{2x}{1 + \sqrt{1-4x^2}}$$

$$x \in \left[\frac{1}{y}, \frac{1}{y}\right] \leftarrow$$