

$$f(x) = \begin{cases} x^3 - 1 & x > a \\ 14x - 2 & x \leq a \end{cases}$$

(20)

عند

عند

$$a^3 - 1 > 14a - 2 \Rightarrow a^3 \geq 14a + 1 > 0 \Rightarrow (a-1)(a^2+a-1)$$

$$\Rightarrow (a-1)(a-1)(a+1) \geq 0 \Rightarrow \begin{array}{c|c|c} - & + & + \\ \hline - & + & + \end{array} \Rightarrow [1, +\infty)$$

$$f^{-1}(1) \in \mathbb{R}, f(x) = 14x + k \Rightarrow 14 + k = 1 \Rightarrow k = -13$$

$$\rightarrow k = -13$$

$$(a) \rightarrow 14x - 1 \Rightarrow 14(1) - 1 = 13$$

$$b) f(f(x)) \rightarrow f(14x - 1) \rightarrow 14(14x - 1) - 1 = 196x - 15$$

$$f(x) = \frac{ax}{x-1} \rightarrow (a, a) \in \mathbb{R}$$

$$y = \frac{ax}{x-1} \xrightarrow{f^{-1}} x = \frac{ay}{y-1}$$

$$\rightarrow xy - x = ay \rightarrow xy - ay = x \rightarrow y(x-a) = x \rightarrow y = \frac{x}{x-a}$$

$$(a, a) \rightarrow a = \frac{1a}{a} \Rightarrow a = 1$$

$$a) f \circ f^{-1} = \{(1, 1), (2, 2), (4, 4)\}$$

$$b) f^{-1} \circ f = \{(1, 1), (2, 2), (4, 4)\}$$

$$c) f \circ f^{-1} = \{(1, 4), (2, 2)\}$$

$$d) f^{-1} \circ f = \{(1, 4), (2, 2)\}$$

Let $\{ (1,2), (3,0), (2,1), (1,1) \}$ and $\{ (1,1), (1,3), (1,2) \}$ be

$$h = \{ (1,2), (3,0), (2,1), (1,1) \}$$

$$g^{-1} = \{ (1,2), (3,0), (2,4) \} \rightarrow f \circ g^{-1} = \{ (1,1), (0,1), (3,1) \}$$

$$\frac{h}{f \circ g^{-1}} = (1, \frac{2}{1}), (3, \frac{0}{1})$$

5

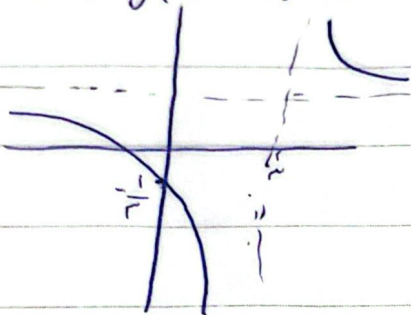
$$y = \frac{3x+1}{x-2}$$



سوال 5

$$x \leq \frac{3y+1}{y-2} \rightarrow xy - 2x \leq 3y+1 \rightarrow xy - 3y \leq 2x+1$$

$$\rightarrow y(x-3) \leq 2x+1 \rightarrow y \leq \frac{2x+1}{x-3}$$



5

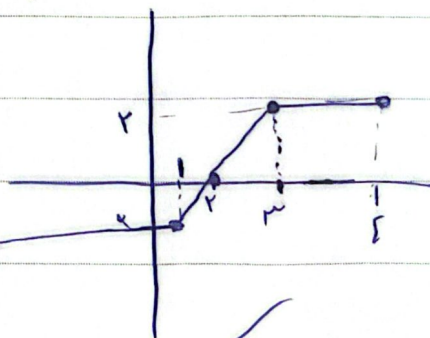
$$f(x) = |x-1| - |x-3|$$

سوال 4

	1	3
-2	$2x-2$	2

$$f(x) = |x-1| - |x-3| \rightarrow \begin{pmatrix} 3 \\ 1 \end{pmatrix} \begin{pmatrix} -1 \\ -1 \end{pmatrix} \rightarrow y = 2x - 2$$

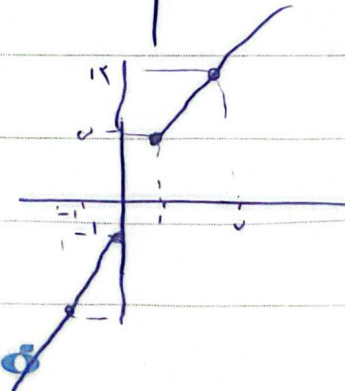
$$\rightarrow x \leq 2y - 2 \rightarrow y \geq \frac{x+2}{2}$$



5

$$f(x) = \begin{cases} x^2 + 1 & x \geq 1 \\ |x-1| & x \leq 0 \end{cases}$$

$$f'(x) = \begin{cases} 2x & x \geq 1 \\ -1 & x \leq 0 \end{cases}$$



سوال 3

5

$$x^r = \frac{(x+1)^r}{x+1} \rightarrow x^r + r x^{r-1} = x^r + r x^{r-1} - r x - 1$$

← 3b

$$= \frac{-rx-1}{x+1} = y \rightarrow y(x+1) = -rx-1$$

$$\rightarrow y(x+1), -rx-1 \rightarrow y(-\frac{rx-1}{x+1}) \times \frac{1}{x+1} \rightarrow -\frac{rx-1}{(x+1)^2}$$

$$b = -r \rightarrow f(-r) = \frac{-r-1}{1} = -r-1$$

$$f(x) = \frac{x}{x^2+1} \quad x, \frac{y}{y^2+1} \rightarrow xy^r + x, y \quad \leftarrow 3c$$

$$xy^r - y + x \rightarrow y \frac{1 \pm \sqrt{-1 \pm r}}{x}$$