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$$f(x) = \begin{cases} x^2 - 4 & x > a \\ 12x - 20 & x \leq a \end{cases} \quad x^2 - 4 > 12x - 20 \rightarrow x^2 - 12x + 16 = (x-2)^2(x+4)$$

$$\frac{-4}{-} + \frac{2}{+} \quad \boxed{-f \leq a}$$

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$$f(x) = 3x + k \quad f^{-1}(2) = 4 \rightarrow f(4) = 2 \rightarrow 12 + k = 2 \rightarrow k = -10$$

$$f(x) = 3x - 10$$

$$f(5) = \boxed{11}$$

$$f(f(x)) = 3(3x - 10) - 10 = \boxed{9x - 40}$$

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$$f(x) = \frac{ax}{x-1} \rightarrow yx - y = ax \rightarrow x = \frac{y}{y-a} \rightarrow y = \frac{x}{x-a} \rightarrow A(2a, a) \rightarrow$$

$$f(2a) = a \rightarrow \frac{2a}{2a-a} = a \rightarrow \boxed{a = 2}$$

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$$f \circ f^{-1}: \{(0,0)(7,7)(2,2)(4,4)\}$$

$$f^{-1} \circ f: \{(2,2)(4,4)(7,7)(0,0)\}$$

$$f \circ g^{-1}: \{(2,0)(0,7)\}$$

$$g^{-1} \circ f: \{(2,7)(7,2)(0,8)\}$$

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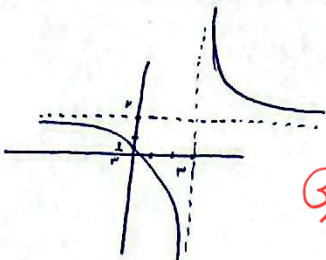
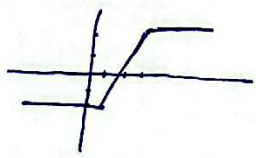
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$$\left. \begin{aligned} g^{-1}: (1,2)(3,4)(0,9) \\ f \circ g^{-1}: (1,4)(3,9)(0,0) \\ h: (1,2)(2,4)(4,1)(0,1) \end{aligned} \right\}$$

$$\frac{h}{f \circ g^{-1}} = \boxed{\{(1, \frac{1}{4})(3, \frac{1}{9})\}}$$

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$f(x) = \frac{r x + 1}{r x - 1} \rightarrow x = \frac{r y - 1}{y - r} \rightarrow y = \frac{r x - 1}{x - r} = y$ تساوی است 	6
$f(x) = x-1 - x-3 \rightarrow \begin{cases} r, & x \geq 3 \\ r x - 2, & 1 \leq x \leq 3 \\ -r, & x \leq 1 \end{cases}$ $[a, b] = [1, 3]$ $f(x) = r x - r \rightarrow f^{-1}(x) = \frac{x+r}{r}, \quad 1 \leq x \leq 3$ $1 \leq x \leq 3$ 	7
$f(x) = \begin{cases} x^r - r, & x \geq 1 \\ f_{x-1}, & x \leq 0 \end{cases} \rightarrow y = x^r - r \rightarrow x = \sqrt[r]{y+r} \rightarrow y = \sqrt[r]{x-r}, \quad x \geq 1$ $y = f_{x-1} \rightarrow x = \frac{y+1}{r}, \quad x \leq -1$	8
$f(x) = x^r - \frac{(x+1)^r}{x+r} \rightarrow \frac{x^r + r x^r - x^r - r x^r - r x - 1}{x+r} = \frac{-r x - 1}{x+r} \xrightarrow{\text{والب}} y = \frac{-r x - 1}{x+r}$ $f^{-1}(x) = \frac{a x + b}{r x + d} = \frac{-r x - 1}{r x + r} \rightarrow b = -r$ $f(-r) = \frac{1^r - r}{r} = \boxed{\frac{1}{r}}$	9
$f(x) = \frac{x}{x^r + 1} \rightarrow \frac{y}{y^r + 1} = x \rightarrow y = x y^r + x \rightarrow x y^r - y + x = 0 \rightarrow y = \frac{1 \pm \sqrt{1 - 4 x^2}}{2 x}$ ✓ (2) $-\frac{1}{r} \leq x \leq \frac{1}{r}, \quad x \neq 0$	10