

$$12a - 10 \leq a^3 - 4$$

$$\rightarrow a^3 - 12a + 14 \geq 0 \xrightarrow{\text{صرفی بند}} a = 2 \rightarrow (a-2)(a^2+2a-1) \quad a \in [-4, +\infty)$$

$$\rightarrow (a-2)(a+2) \geq 0 \quad \begin{array}{c} -2 \quad 2 \\ - \quad + \quad + \end{array}$$

$$f(x) = 3x + k \rightarrow 3f^{-1}(x) + k = x \rightarrow f^{-1}(x) = \frac{x-k}{3}$$

$$\begin{aligned} x=2 \quad 2-k=12 \rightarrow k=-10 & \rightarrow f(x) = 3x-10 \rightarrow \boxed{f(4)=2} \\ & \rightarrow f^{-1}(x) = \frac{x+10}{3} \rightarrow f \circ f(x) = 3\left(\frac{3x-10}{3}\right) - 10 = \boxed{9x-40} \end{aligned}$$

$$(2, a) \in f^{-1}(x) \rightarrow (a, 2a) \in f(x)$$

$$\rightarrow \frac{a^2}{a-1} = 2a \rightarrow a^2 = 2a^2 - 2a \rightarrow a^2 - 2a = 0$$

$$\boxed{a=2}$$

$$\rightarrow a=0 \rightarrow f(x) = 0 \rightarrow x=1$$

$$f^{-1}: \{(5, 2), (7, 4), (2, 5), (4, 9)\} \quad g^{-1}: \{(4, 2), (2, 1), (6, 9)\}$$

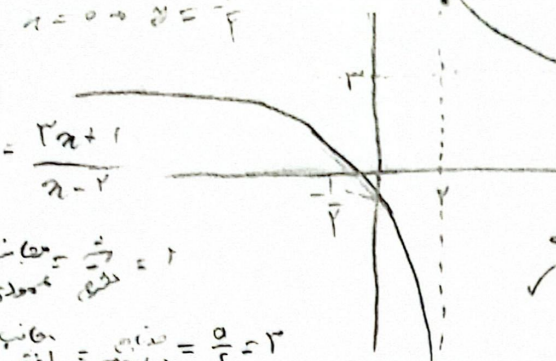
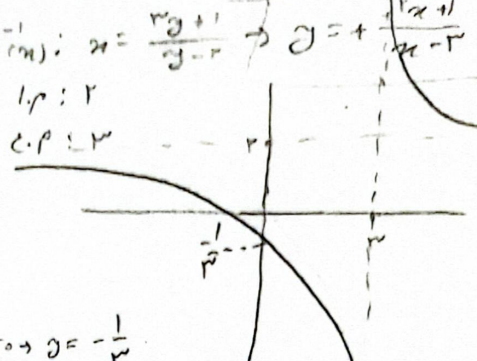
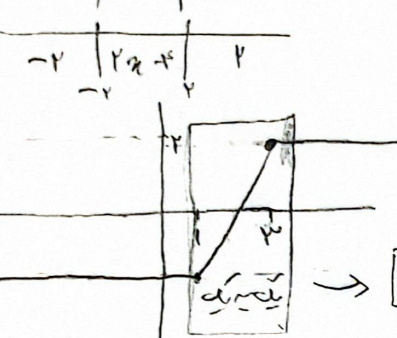
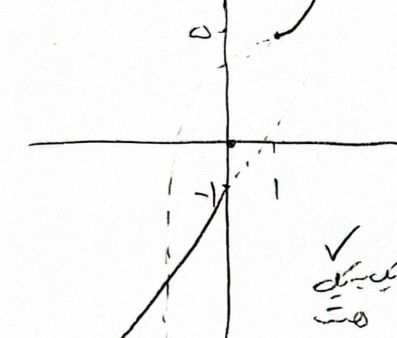
$$\text{الف)} \{(0, 0), (7, 7), (2, 2), (4, 9)\} \quad \text{ب)} \{(3, 3), (4, 4), (7, 7), (9, 9)\}$$

$$\text{ج)} \{(2, 0), (0, 9)\} \quad \text{د)} \{(3, 9), (7, 3), (9, 1)\}$$

$$\frac{h}{f \circ g^{-1}} \rightarrow h: \{(1, 2), (3, 4), (4, 1), (5, 1)\}$$

$$g^{-1} = \{(1, 2), (3, 4), (5, 9)\} \rightarrow f \circ g^{-1}: \{(1, 4), (3, 1), (5, 0)\}$$

$$\rightarrow \frac{h}{f \circ g^{-1}} = \{(1, \frac{2}{4}), (3, \frac{4}{1}), (\cancel{5, \frac{0}{0}})\}$$

$x=0 \Rightarrow y = \frac{1}{r}$ $y = \frac{rx+1}{x-r}$ معادله: $\frac{y}{x} = \frac{1}{r}$ جواب: $\frac{y}{x} = \frac{1}{r} \Rightarrow y = \frac{x}{r}$ $\lim_{x \rightarrow 0} \frac{y}{x} = \frac{0}{0} = \frac{1}{r}$ 	$f^{-1}(x): x = \frac{ry+1}{y-r} \Rightarrow y = \frac{rx+1}{x-r}$ $l_r: r$ $c.p: r$ $x=0 \Rightarrow y = -\frac{1}{r}$ 
 $[a, b] = [1, r] \rightarrow f^{-1}(x): x = ry - r \rightarrow y = \frac{x+r}{r}$	$y = \frac{x+r}{r}$
	$f^{-1}(x) = \begin{cases} y = \sqrt{x-r} & x \geq 0 \\ x = y^2 + r & y \geq 1 \end{cases}$ $\Rightarrow f^{-1}(x) = \begin{cases} \sqrt{x-r} & x \geq 0 \\ \frac{x+1}{r} & x \leq -1 \end{cases}$
$f^{-1}(x): x = y^r - \frac{(y+1)^r}{y+r} = \frac{-ry-1}{y+r} \Rightarrow f^{-1}(x): y = -\frac{rx+1}{x+r} = \frac{-9x-2}{2x+9}$ $f^{-1}(b) = \frac{-9(-2)-2}{2(-2)+9} = \frac{10}{1} = 10$	
$f^{-1}(x): x = \frac{y}{y^2+1} \Rightarrow xy^2 - y + x = 0 \Rightarrow y = \frac{1 \pm \sqrt{1-4x^2}}{2x}$ $y = \frac{1 + \sqrt{1-4x^2}}{2x}$ $y = \frac{1 - \sqrt{1-4x^2}}{2x}$	$y = \frac{1 \pm \sqrt{1-4x^2}}{2x}$ $\sqrt{1-4x^2} = 1$ $1-4x^2 = 1$ $-4x^2 = 0$ $x = 0$ $y = \frac{1 \pm \sqrt{1-4x^2}}{2x}$ $y = \frac{1 \pm \sqrt{1-4x^2}}{2x}$ $y = \frac{1 \pm \sqrt{1-4x^2}}{2x}$