۱) $fg = \{(-1,2)(0,5)(2,0)(1,4)\}$

$f \to f^{-1} = \{(-1,0)(0,1)(2,-3)(1,0)\} \to {}^{-3}f = \{(-1,0)(0,2)(1,0)\}$ تعویض شده

$fg - {}^{-3}f = \{(-1,2)(0,5)(1,4)\} \to R = \{2,5,4\} \to 2+4+5 = 11$

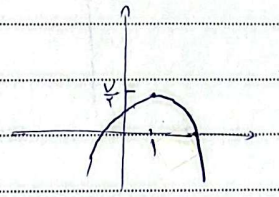
۲) $x \gtrless 2 \to 2x \gtrless 4 \to 2x-1 \gtrless 5 \to R_f = [5,+\infty)$

$\to [5,+\infty) \cup (-\infty,4]$

$x \leq 2 \to \frac{1}{2}x \leq 1 \to \frac{1}{2}x+3 \leq 4 \to R_g = (-\infty,4] = R - (4,5)$

۳) $\frac{3}{2} = -\frac{x^2}{2} + x + 3 \to 3 = -x^2 + 2x + 6 \to x^2 - 2x - 3 = 0 \to (x-3)(x+1) = 0$

$x \nearrow^{3}_{-1} \to (a,b) = (-1,3) \to \sqrt{b-a} = \sqrt{3-(-1)} = \sqrt{4} = 2$



$ext \begin{cases} -\frac{b}{2a} = \frac{-1}{2(-\frac{1}{2})} = 1 \\ -\frac{1}{2}+1+3 = \frac{7}{2} \end{cases}$

۴) $x=1 \to y = |1-1| + |1-3| + |4-4| = 0+2+2 = 4$

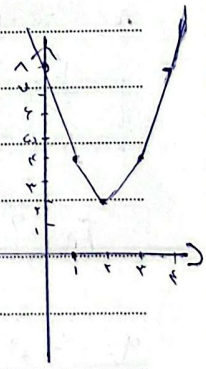
$x=3 \to y = |3-1| + |3-3| + |6-4| = 2+2 = 4$

$x=2 \to y = |2-1| + |2-3| + |4-4| = 2$

$x=4 \to y = |4-1| + |4-3| + |8-4| = 3+1+4 = 8$

$x=0 \to y = |0-1| + |0-3| + |0-4| = 8$

بیشترین مقدار $= 2$



۵)

	-1		0	
	$-x+2x+2 = x+2$		$-x-2x-2 = -3x-2$	$x-2x-2 = -x-2$

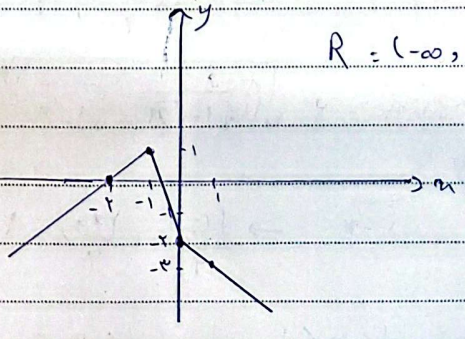
$x=0 \to y = -2$

$x=-1 \to y = 1$

$x=1 \to y = -3$

$x=-2 \to y = 0$

$R = (-\infty,1]$



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۶) $y = x^2 + 5x + m \longrightarrow x^2 + (5-y)x + m - y = 0$

$\Delta \geq 0 \longrightarrow (5-y)^2 - 4(m-y) \geq 0 \longrightarrow 25 + y^2 - 10y - 4m + 4y \geq 0$

$\longrightarrow y^2 - 6y + 25 - 4m \geq 0$ $\begin{cases} a > 0 \checkmark \\ \Delta \leq 0 \longrightarrow b^2 - 4ac \leq 0 \longrightarrow b^2 \leq 4ac \longrightarrow 36 \leq 4(25 - 4m) \\ \div 4 \quad 9 \leq 25 - 4m \longrightarrow 4m \leq 16 \longrightarrow \boxed{m \leq 4} \end{cases}$

$m = \{1, 2, 3, 4\}$

۷) $x+2 \longrightarrow x = -2 \longrightarrow y = 5$

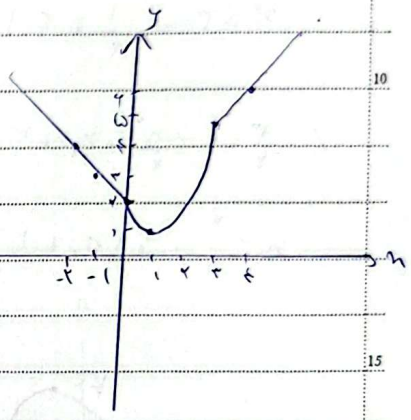
$x = 4 \longrightarrow y = 9$

$x^2 - 2x + 2 \longrightarrow \frac{-b}{2a} = \frac{2}{2} = 1 \longrightarrow x = 0 \longrightarrow y = 2$

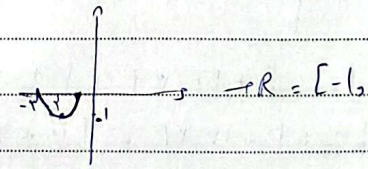
ext $1 - 2 + 2 = 1$ $\quad x = 2 \longrightarrow y = 5$

$x < 0 \longrightarrow x = 0 \longrightarrow y = 2$ $\quad \boxed{R = [1, +\infty)}$

$x = -1 \longrightarrow y = 4$



۸) $(x+1)(x+2) = 0 \longrightarrow x = -1, -2$



$\longrightarrow R = [-1, 0]$ ①

ext $\frac{-b}{2a} = \frac{-4}{4} = -2$

$4 - 8 + 2 = -1$

$R = \text{برد} = [-1, 0]$

$[2x] - 2x \longrightarrow (-1, 0]$ ②

۹) $2x + 3 \geq 0 \longrightarrow 2x \geq -3 \longrightarrow x \geq -\frac{3}{2} \longrightarrow D = [-\frac{3}{2}, +\infty)$

کمترین مقدار $= 0$ $\qquad b$

$a = a + 1 - 0 \longrightarrow \boxed{a = 4}$ $\qquad ab = 2 \times \frac{-3}{2} = \boxed{-6}$

۱۰) $g(x) + 2\sqrt{x+1} + 2\sqrt{1-x} = 2\sqrt{\left(\sqrt{1+x} + \sqrt{1-x}\right)^2} = 2\sqrt{1+x} + 2\sqrt{1-x}$

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

$\frac{f(x) + g(x)}{4} = \frac{4\sqrt{1-x}}{4} = \sqrt{1-x} \qquad -1 \leq x \leq 1 \longrightarrow -1 \leq -x \leq 1 \longrightarrow 0 \leq 1-x \leq 2 \longrightarrow 0 \leq \sqrt{1-x} \leq \sqrt{2}$

$D_f = D_g = [-1, 1]$ $\qquad \boxed{R = [0, \sqrt{2}]}$

Arman

$x + 1 \geq 0 \longrightarrow x \geq -1 \longrightarrow [-1, 1]$