

① اگر فرض کنیم $\frac{1}{y} = \frac{x}{2}$ 14, 5 B (2)

$$(x - 2 \lfloor \frac{x}{2} \rfloor)^2 \rightarrow f(\frac{x}{2} - \lfloor \frac{x}{2} \rfloor) \xrightarrow{x \in [0, 1]} x \in [0, \epsilon]$$

• $\hookrightarrow -\sin x + \log y - \epsilon = 0 \rightarrow \log y = \sin x + \epsilon \rightarrow y = 10^{\sin x + \epsilon}$

$-1 \leq \sin x \leq 1 \rightarrow [10^{-1}, 10^1]$ ✓

② $\sqrt{\frac{x^2 - \epsilon}{x^2 - 4}} \xrightarrow{x \rightarrow \frac{2}{3}} \frac{2}{3}$ (2)

از $x = \frac{2}{3}$ به سمت راست و چپ $\rightarrow [0, \frac{2}{3}] \cup (1, +\infty)$

$a + b + c = 1 + \frac{2}{3} + 0 = \frac{5}{3}$

③ الف) $f(x) = x + \frac{1}{x} + 2\sqrt{x + \frac{1}{x}} \rightarrow \sqrt{x + \frac{1}{x}} = z$ (2)

$\sqrt{x + \frac{1}{x}} \xrightarrow{\text{مربع}} \sqrt{2} \quad [2 + \sqrt{2}, +\infty)$

$z^2 + 2z$

$\hookrightarrow (3 - \sin x)(1 + \sin x) \quad -1 \leq \sin x \leq 1$ [0, 4]

$2 \leq \dots \leq 4 \quad \dots \leq 2 \rightarrow \max = 4, \min = 0$

④ $f(x) = -\frac{1}{x}x + 10$ (2)

$1, 2, 3, 4, 5, 6, 7, 8, 9$

$\frac{1}{9} + 10 + \frac{2}{9} + 10 + \frac{3}{9} + 10$

$90 - 10 = 80$ ✓

$\frac{9 \times 10}{2} = 45 \quad \frac{-45}{9} = -5$

⑤ $f(x) = \sqrt{ax^2 + bx + c}$ [2, +\infty) (10)

$ax^2 + bx + c = a(x - r)^2$

$a = 1, b = -2, c = 3$

$a < 0, b < 1, c < -2$

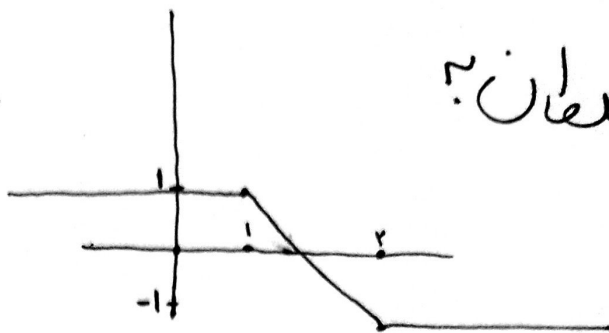
$g(x) = \sqrt{-x^2 + 4x - 4} \rightarrow \frac{-\Delta}{4a} = 1 \rightarrow \sqrt{1} = 1 \rightarrow (0, 2]$

$g(x) = \sqrt{x^2 + 2}$ Dg = [2, +\infty)

4) $|x-2| - |x-1| = kx$

$\Rightarrow |x-2| - |x-1| = kx$

$-1 = k \times 2 \rightarrow k = -\frac{1}{2}$



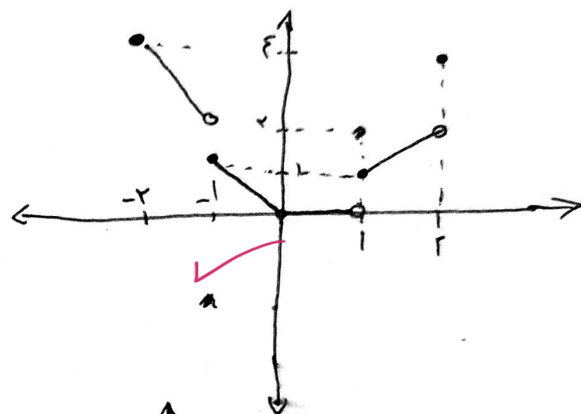
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5) الف) $x[x]$

$Ry = [-2, 2] - \{1\}$

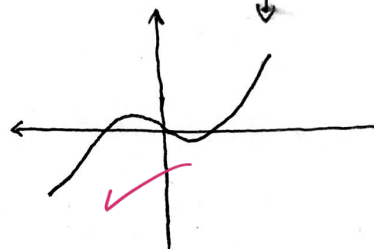
$\begin{cases} x=2 \rightarrow f \\ 1 \leq x < 2 \rightarrow [x]=1 \\ 0 \leq x < 1 \rightarrow [x]=0 \\ -1 \leq x < 0 \rightarrow [x]=-1 \\ -2 \leq x < -1 \rightarrow [x]=-2 \end{cases}$



$\hookrightarrow x|x| - x$

$\begin{cases} x \geq 0 \rightarrow x^2 - x \\ x \leq 0 \rightarrow -x^2 - x \end{cases}$

$Ry = [-2, 2]$



6) $y = \frac{1}{x} + \frac{1}{x+1} + \frac{1}{x^2+x} \rightarrow y = \frac{2x+2}{x^2+x} \rightarrow yx^2 + yx = 2x+2$

$\rightarrow yx^2 + (y-2)x - 2 = 0 \rightarrow \Delta = (y-2)^2 + 8y$

$Ry = (2, \infty) - \{0, -2\}$

$y = \frac{x+1+x+1}{x(x+1)} = \frac{2}{x}$

$x < 0 \rightarrow y = \infty$

$x < -1 \rightarrow y = -2$

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

$\rightarrow \sqrt{x} = \frac{y-1}{y-1} = 1$

8) $f(x) = \frac{x^2 + 2x^2 - x - 2}{x^2 - 1} = \frac{(x-1)(x+1)(x+2)}{(x-1)(x+1)} = x+2$

$x+1 = 1$