

۱۹,۵ آفرین!

الف) $y = \sqrt{\frac{x}{4} - \left[\frac{x}{4}\right]} \Rightarrow R_f \in [0, 4] \checkmark$
 $0 \leq \frac{x}{4} < 1$ $-1 \leq \frac{x}{4} \leq 1$

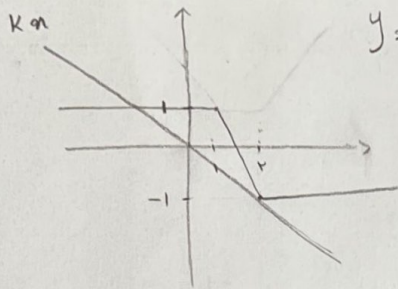
ب) $\log y = \sin x + 4 \Rightarrow y = 10$
 $\sin x + 4 \rightarrow 3 \leq \sin x + 4 \leq 5$
 $\Rightarrow y = 10^{\min} \rightarrow R_f \in [10^3, 10^5]$
 $\hookrightarrow 10^{\max} \checkmark$

$\sqrt{\frac{x^2 - 4}{x^2 - 4}} \Rightarrow [0, \frac{4}{9}] \cup (1, +\infty)$
 $\sqrt{\frac{x^2 - 4}{x^2 - 4}} \Rightarrow [0, \frac{4}{9}] \cup (1, +\infty)$
 $a + b + c \Rightarrow \frac{5}{3} \checkmark$

الف) $x < 0 \rightarrow x + \frac{1}{x} \leq -2$ $x > 0 \rightarrow x + \frac{1}{x} \geq 2$
 $D_f \in [0, +\infty)$ $G \cup E$
 $f(x) = x + \frac{1}{x} + 2\sqrt{x + \frac{1}{x}}$
 $(\frac{1}{2}, +\infty)$ $[2, +\infty)$
 $\Rightarrow R_f \in [2, +\infty)$
 $\Rightarrow R_f \in [0, 4] \checkmark$

$D_f \in \{1, 2, 3, \dots, 9\}$
 $f(1) + f(2) + \dots + f(9) \Rightarrow \frac{9 \times 10}{9} + (-\frac{1}{9})(1 + 2 + \dots + 9) = 9 - 15 = -6 \checkmark$
 $-\frac{1}{9} \times \frac{9 \times 10}{2} = -15$

$f(x) = \sqrt{K(x-2)}$
 $f(2) = \sqrt{K(2-2)} = 0$
 $f(3) = \sqrt{K(3-2)} = 1$
 $g(x) = \sqrt{x^2 + 4} \Rightarrow R_g \in [2, +\infty) \checkmark$



$$y = Kx \rightarrow (2, -1) \rightarrow -1 = 2K \rightarrow \boxed{K = -\frac{1}{2}} \text{ جواب}$$

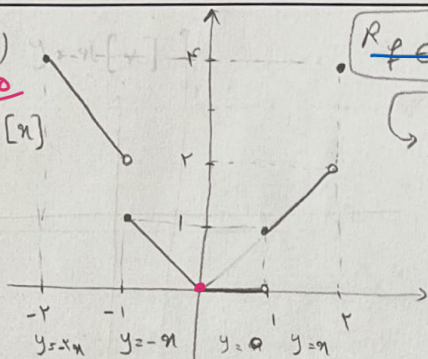
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$$R_f = [0, 2] - \{1\}$$

الف) ۱.۷۵

$$y = x[x]$$



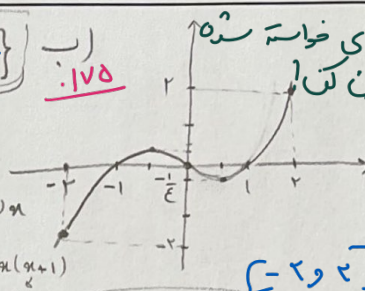
$$R_f \in \mathbb{R} - \{2, 4, 1, -1\}$$

ب) ۱.۷۵

$$y = x|x| - x$$

$$\textcircled{+} x^2 - x = (x-1)x$$

$$\textcircled{-} -x^2 - x = -x(x+1)$$



$$[-2, 2]$$

$$R_f \in \mathbb{R}$$

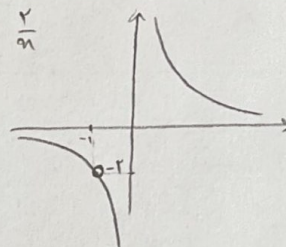
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$$y = \frac{x+1 + x+1}{x^2 + x} = \frac{2x+2}{x^2 + x} = \frac{2(x+1)}{x(x+1)} = \frac{2}{x} \quad x \neq 0, -1$$

$$D_f \in \mathbb{R} - \{0, -1\}$$

$$\frac{2}{x} \rightarrow -2 \text{ GOE}$$



$$R_f \in \mathbb{R} - \{0, -2\} \rightarrow a+b = \boxed{-2} \text{ جواب}$$

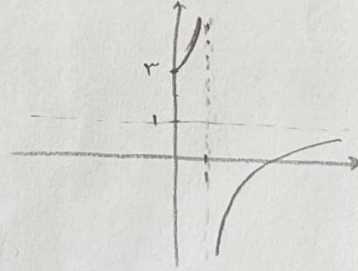
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$$f(x) = \frac{(\sqrt{x}-1)(\sqrt{x}-2)}{(\sqrt{x}-1)^2} = \frac{\sqrt{x}-2}{\sqrt{x}-1} \Rightarrow \sqrt{x} \in +\infty$$

$$D_f \in [0, +\infty) - \{1\}$$

$$\sqrt{x} \geq 0 \rightarrow 2 / \sqrt{x} \geq +\infty \Rightarrow 1$$



$$R_f \in (-\infty, 1) \cup [2, +\infty) \text{ جواب}$$

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$$\begin{array}{r} x^2 + 2x^2 - x - 2 \\ -x^2 - x^2 \\ \hline x^2 - x \\ -2x^2 - 2x \\ \hline -x^2 - x \\ -x^2 - x \\ \hline 2x - 2 \end{array} \quad \begin{array}{r} x-1 \\ x^2 + 2x + 2 \\ \hline (x+1)(x+2) \end{array}$$

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

$$D_f \in \mathbb{R} - \{\pm 1\}$$

$$R_f \in \mathbb{R} - \{1, 2\}$$

$$1+2 = \boxed{3} \text{ جواب}$$

$$\begin{array}{l} x=1 \quad y=3 \\ x=2 \quad y=4 \end{array}$$

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