

(الف) $y = (x - 2 \lfloor \frac{x}{4} \rfloor)^4 = 4 \left(\frac{x}{4} - \lfloor \frac{x}{4} \rfloor \right)^4 \Rightarrow 0 \leq \frac{x}{4} - \lfloor \frac{x}{4} \rfloor < 1$ (الف) (2)

$0 \leq 20 < 4 \Rightarrow IR = [0, 4)$ ✓

$\sin x + \log y - 4 = 0 \Rightarrow \log y = 4 - \sin x \Rightarrow 4 \leq \sin x + 4 \leq 5$

$4 \leq \log y \leq 5 \Rightarrow \log 4 \leq \log y \leq \log 5 \Rightarrow IR = (10^4, 10^5)$ ✓

$\sqrt{\frac{2x^2 - 4}{2x^2 - 9}}$ $\left\{ \begin{array}{l} \max = +\infty \\ \min = 0 \end{array} \right\}$ $\max = 1$ $\min = \frac{4}{9} \Rightarrow (-\infty, \frac{4}{9}] \cup (1, +\infty)$ (2)

~~$[0, \frac{4}{9}] \cup (1, +\infty)$~~ $\Rightarrow \frac{4}{9}$ ✓

$f(x) = x - \frac{1}{20} + 2\sqrt{20 + \frac{1}{20}}$ $D_f = (0, +\infty) \Rightarrow$ (الف) (2)

$20 + \frac{1}{20} > 1 \Rightarrow 1 + 2\sqrt{2} = \min, +\infty = \max$ $R = [1 + 2\sqrt{2}, +\infty)$ ✓

$g = (4 - \sin x)(1 + \sin x) = 4 + \sin 2x - \sin x - \sin^2 x =$ (الف)

$4 + \sin 2x - \sin^2 x + 4$

$\sin x = 1 \rightarrow x = \frac{\pi}{2}$

$\sin x = -1 \rightarrow x = \frac{3\pi}{2}$

$1 = \frac{b}{20} \Rightarrow 20 = 4$

$R_g = [0, 4]$ ✓

$f(x) = -\frac{1}{2}x^2 + 10$ $D_f = \{1, 2, \dots, 9\}$ $f(1) = \frac{19}{2}$ (2) (ف)

$\frac{1}{n} (x_1 + (n-1)d)$

$\frac{1}{n} (x_1 + x_n)$

$\frac{100}{2} = 50$ ✓

$f(x) = \frac{10}{x} \rightarrow \frac{10}{1} = 10$

$f(x) = \sqrt{ax^2 + bx + c}$

$D_f = [x, +\infty)$

$x = r \Rightarrow r, b, c = 0$ $x = r \Rightarrow r, b, c = 1$ $b > 0, d = 0$

$b = 1, c = 4$

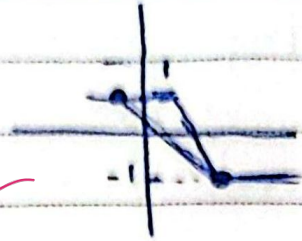
$g(x) = \sqrt{x^2 + 4x}$

$\Rightarrow g = 2x + 4$

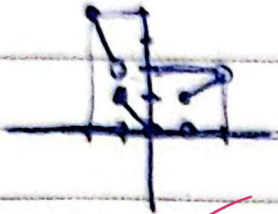
$\rightarrow \min \rightarrow IR = [r, +\infty)$ ✓

$$|2x-1| - |2x-1| = Kx \rightarrow x=0, 1$$

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



(2) (9)



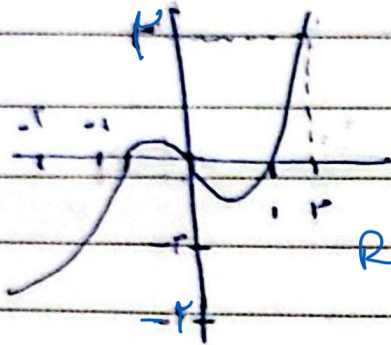
$$R_f = [0, 2] \cup [2, 3]$$

$$f(x) \Rightarrow x < -1 \Rightarrow y = -2x \Rightarrow 1, 2 \quad (V)$$

$$f(x) \Rightarrow -1 < x < 0 \Rightarrow y = -x \Rightarrow 1, 0$$

$$f(x) \Rightarrow 0 < x < 1 \Rightarrow y = 0$$

$$f(x) \Rightarrow 1 < x < 2 \Rightarrow y = x \Rightarrow 1, 2$$



$$f(x) \Rightarrow x < 0 \Rightarrow y = -x$$

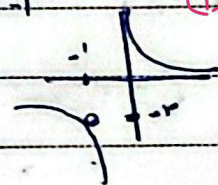
$$f(x) \Rightarrow x < 0 \Rightarrow y = -x$$

$$R_y = [-2, 2]$$

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

افزایش کسری! (2) (1)

$$R_y = \{R - \{0, -1\}\}$$



$$f(x) = \frac{(\sqrt{x}-1)(\sqrt{x}-3)}{(\sqrt{x}-1)(\sqrt{x}-1)} \rightarrow \frac{\sqrt{x}-3}{\sqrt{x}-1}$$

(2) (9)

$$R_f = (-\infty, 1) \cup (3, \infty)$$

$$\min \sqrt{x} \rightarrow 1$$

$$\max \sqrt{x} \rightarrow 3$$

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

(2) (10)

$$x \neq 1$$

$$x = 1 \in R \quad [1, 1]$$