

الف) $f(x) = 2 \sin^2(x + \frac{\pi}{4}) - 1$

-1

$$-1 \leq \sin(x + \frac{\pi}{4}) \leq 1 \rightarrow 0 \leq \sin^2(x + \frac{\pi}{4}) \leq 1$$

$$0 \leq 2 \sin^2(x + \frac{\pi}{4}) \leq 2 \rightarrow -1 \leq 2 \sin^2(x + \frac{\pi}{4}) - 1 \leq 1$$

$$R_f = [-1, 1]$$

ب) $g(x) = 3 \cos^2 x - 4$

$$-1 \leq \cos x \leq 1 \rightarrow -1 \leq \cos^2 x \leq 1$$

$$-3 \leq 3 \cos^2 x \leq 3$$

$$-7 \leq 3 \cos^2 x - 4 \leq 1$$

$$R_g = [-7, 1]$$

$$-4 \leq 2x - 2 \rightarrow |x| = -x \rightarrow \frac{x}{|x|} = -1 \rightarrow y = -2 \quad [x] = -2$$

$$-2 \leq x \leq -1 \rightarrow |x| = -x = \frac{x}{|x|} = -1 \rightarrow y = -2$$

$$[x] = -2$$

$$-1 \leq x \leq 0 \rightarrow |x| = -x = \frac{x}{|x|} = -1 \rightarrow y = -2$$

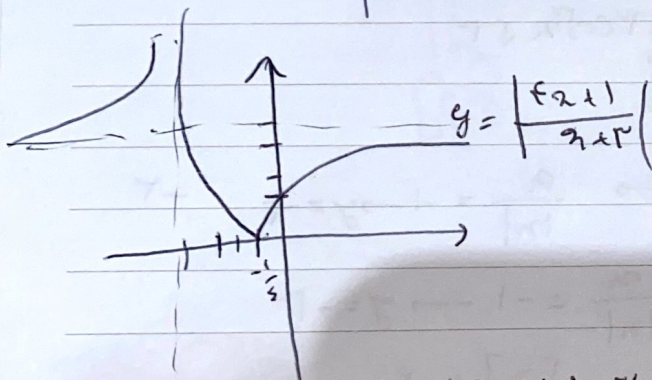
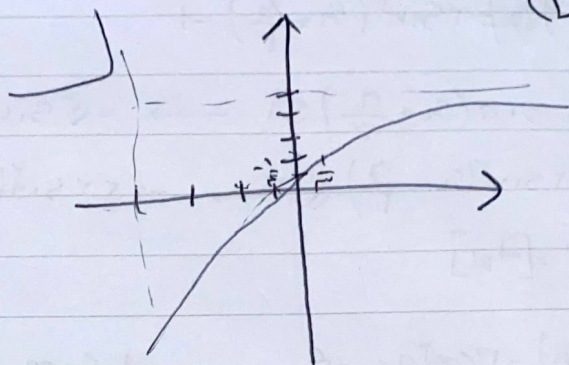
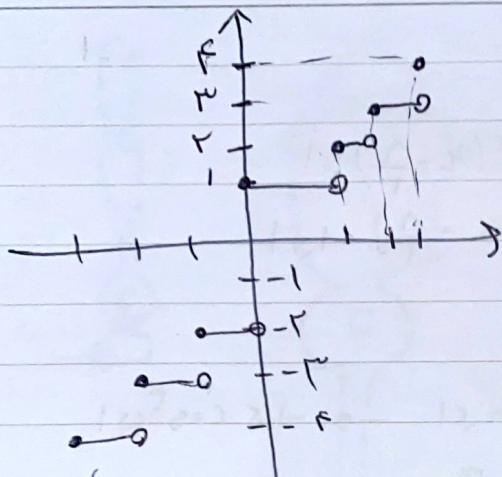
$$[x] = -1$$

$$0 \leq x \leq 1 \rightarrow |x| = x = \frac{x}{|x|} = 1 \rightarrow y = 2$$

$$1 \leq x \leq 2 \rightarrow |x| = x = \frac{x}{|x|} = 1 \rightarrow y = 2$$

$$2 \leq x \leq 3 \rightarrow |x| = x = \frac{x}{|x|} = 1 \rightarrow y = 2$$

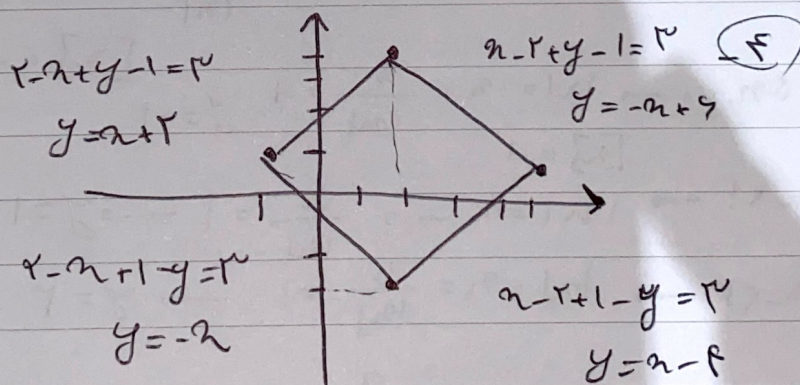
$$x = 3 \rightarrow y = 2$$



$$\frac{f_{n+1}}{w_{n+1}} = y$$

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$$f(n) = n + \frac{1}{n} + \sqrt{n + \frac{1}{n}} \rightarrow n + \frac{1}{n} \geq 0 \quad \textcircled{a}$$

$\left(\sqrt{n + \frac{1}{n}}\right)^r + r \sqrt{n + \frac{1}{n}}$

$\frac{-6}{ra} = -1 \alpha$

R_f

$$R_f = [r, \sqrt{r}, +\infty)$$

$$\therefore y = (r \sin x)(1 + \sin x) = r + r \sin x - \sin x - \sin^2 x =$$

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

$$\begin{array}{l} \text{sin } x \begin{cases} -1 - r + r = -1 \\ -1 + r + r = r - 1 \end{cases} \\ \frac{-b}{2a} = \frac{-r}{-2} = 1 \end{array}$$

$$R_f = [0, \frac{r}{2}]$$

$$D_f = \{1, \frac{1}{2}, \frac{1}{3}, \dots, \frac{1}{n}, \dots\}$$

$$\frac{1}{r} \times 1 + 1 + \frac{1}{r} \times \frac{1}{2} + 1 + \dots + \frac{1}{r} \times \frac{1}{n} + 1 = -\frac{1}{r} (1 + \frac{1}{2} + \dots + \frac{1}{n})$$

$$= -\frac{1}{r} \times \frac{1}{2} + 1 = 1 - \frac{1}{2r} = \frac{2r-1}{2r}$$

$$f(x) = \sqrt{ax^2 + bx + c} \quad ax^2 + bx + c \geq 0$$

$$f(x) = \sqrt{bx + c} = 1$$

$$bx + c = 1$$

$$a = 0$$

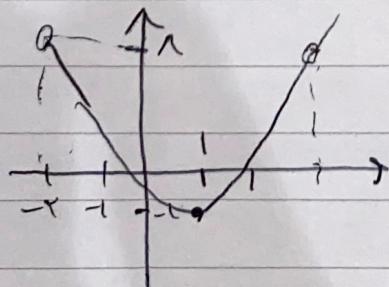
$$b = 1, c = -1$$

$$\min(0, \frac{1}{2})$$

$$R_g = \sqrt{f, +\infty} = [1, +\infty)$$

$$g(x) = \sqrt{x^2 + 1}$$

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



$$x^2 - 1 - 1 = 0 \rightarrow (x-1)(x+1) = 0$$

$$x = 1, x = -1$$

$$\{a, b\} = \{-1, 1\} \quad f\left(\frac{a+b}{2}\right) = f(0) = -1$$

$$1 + 1 = 2$$

$$\min(1, -1)$$

$$R_f = [-1, +\infty) \rightarrow C = -1$$

$$y = \sqrt[3]{x^3 + ax^2 + bx - 1} \longrightarrow y = \sqrt[3]{(x-1)^3} =$$

(4)

$$\sqrt[3]{x^3 - 4x^2 + 12x - 1} \longrightarrow a = -4, b = 12$$

$$-4 \leq x \leq 12 \longrightarrow -1 \leq x - 1 \leq 11 \longrightarrow R_f = [-1, 11]$$

$$f = [x] + \left[x + \frac{1}{x}\right]$$

(6)

$$\frac{1}{x} \leq x \leq 1 \longrightarrow 1 \leq x + \frac{1}{x} \leq \frac{x}{x} \longrightarrow [x] + \left[x + \frac{1}{x}\right] = 0 + 1 = 1$$

$$1 \leq x \leq \frac{x}{x} \longrightarrow \frac{x}{x} \leq x + \frac{1}{x} \leq 2 \longrightarrow [x] + \left[x + \frac{1}{x}\right] = 1 + 1 = 2$$

$$\frac{x}{x} \leq x \leq 2 \longrightarrow 2 \leq x + \frac{1}{x} \leq \frac{2}{x} \longrightarrow [x] + \left[x + \frac{1}{x}\right] = 1 + 2 = 3$$

