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

$1 \leq \sin(n + \frac{\pi}{2}) \leq 1 \rightarrow 1 \leq 2\sin(n + \frac{\pi}{2}) \leq 2$

$-1 \leq 2\sin(n + \frac{\pi}{2}) - 1 \leq 1 \quad R_f = [-1, 1]$

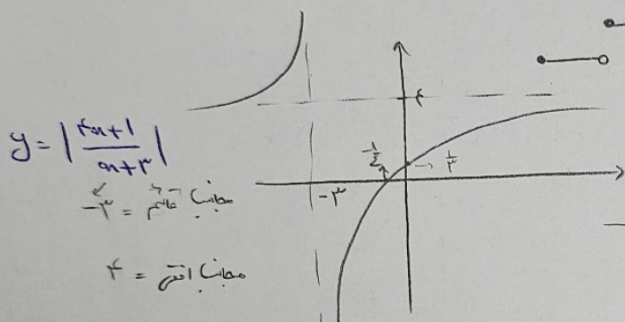
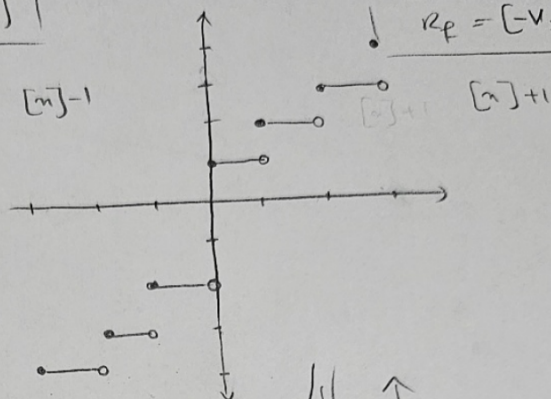
$y = \frac{n}{\ln|n|} + [n] \quad R_f = [-1, 1]$

ب) $g(n) = 3\cos n - 4$

$-1 \leq \cos n \leq 1$

$-3 \leq 3\cos n \leq 3 \rightarrow -7 \leq 3\cos n - 4 \leq -1$

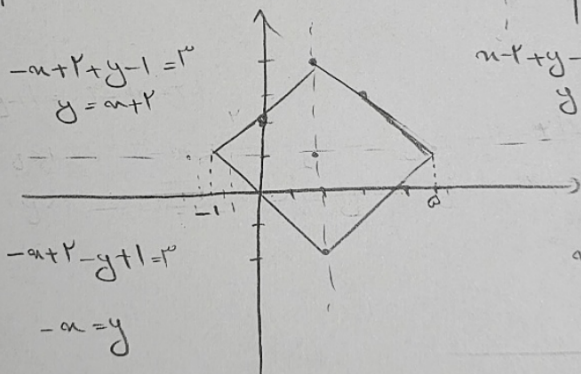
$R_g = [-7, -1]$



$|x-1| + |y-1| = 3$

$-x+1+y-1=3 \rightarrow y=x+3$

$-x+1-y+1=3 \rightarrow -x=y$



$x-1+y-1=3 \rightarrow y=-x+5$

$x-1-y+1=3 \rightarrow x-y=3$

الف) $f(n) = n + \frac{1}{n} + 2\sqrt{n + \frac{1}{n}}$

$(\sqrt{n + \frac{1}{n}} + 1)^2 - 1$

$(2, +\infty)$

$(\sqrt{2}+1)^2 - 1$

$2+1+2\sqrt{2}-1 = 2+2\sqrt{2}$

$R_f = [2+2\sqrt{2}, +\infty)$

ب) $y = (3-\sin n)(1+\sin n)$

$y = 3 + 3\sin n - \sin n - \sin^2 n$

$y = -\sin^2 n + 3\sin n + 3$

$\sin n = 1 \rightarrow -1 + 3 + 3 = 5$

$\sin n = -1 \rightarrow -1 - 3 + 3 = -1$

$R_g = [-1, 5]$

$\sin n = \frac{-b}{2a} = \frac{-3}{-1} = 3 \rightarrow 5$

$$f(n) = -\frac{1}{p}n + 1$$

$$D_f = \{1, 2, 3, \dots, 9\}$$

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$$\left(-\frac{1}{p} + 1\right) + \left(-\frac{2}{p} + 1\right) + \left(-\frac{3}{p} + 1\right) + \dots + \left(-\frac{9}{p} + 1\right) = 9 \times 1 + \left(-\frac{1}{p}\right)(1 + 2 + \dots + 9)$$

$$9 + \left(-\frac{1}{p}\right) \left(\frac{9 \times 10}{2}\right) = \sqrt{9}$$

$$f(n) = \sqrt{an^2 + bn + c}$$

$$D_f = [r, +\infty)$$

$$f(r) = 1$$

$$g(n) = \sqrt{bn^2 + am - rc} \rightarrow R_g = ?$$

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$$\sqrt{bn^2 + am - rc}$$

$$n \geq \frac{-c}{b}$$

$$\left| \frac{-c}{b} = r \right|$$

$$-c = rb$$

$$c = -rb$$

$$\sqrt{rb + c} = 1$$

$$rb + c = 1$$

$$rb - rb = 1$$

$$b = 1$$

$$c = -1$$

$$g(n) = \sqrt{bn^2 - rc}$$

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

$$0 \rightarrow r$$

$$+\infty \rightarrow +\infty$$

$$\Rightarrow R_g = [r, +\infty)$$

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

$$R = \{a, b\} = D_f$$

$$R_f = [c, +\infty) - \{n\}$$

$$f\left(\frac{a+b}{rc}\right)$$

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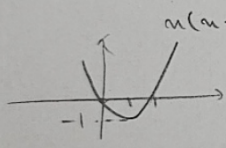
$$\frac{n(n-1)(n+1)}{n+1}$$

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

$$c = -1$$

$$f\left(\frac{-1+1}{-1}\right) = f(-1)$$

$$\Rightarrow -1\left(\frac{-1}{-1}\right) = 1$$



$$n(n-1) = 1$$

$$n^2 - n - 1 = 0$$

$$(n-1)(n+1) = 0$$

$$y = \sqrt{n^2 + an^2 + bn - 1}$$

$$D_f = [a, b]$$

$$R_f = ?$$

$$[-1, 1]$$

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$$(n-1)^2 = n^2 - 4n^2 + 11n - 1$$

$$a = -4 \quad b = 11$$

$$y = \sqrt{(n-1)^2} = n-1$$

$$-4 \leq n \leq 11 \quad -1 \leq n-1 \leq 1$$

$$y = [n] + [n + \frac{1}{p}]$$

$$D_f = \left(\frac{1}{p}, r\right)$$

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