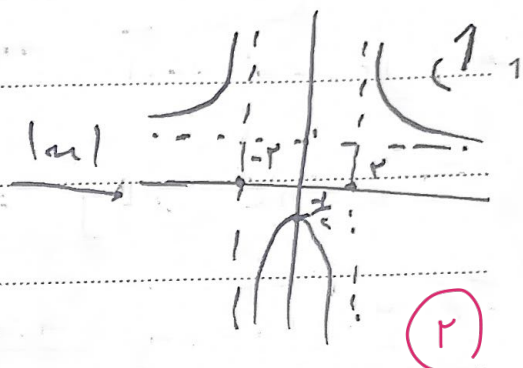
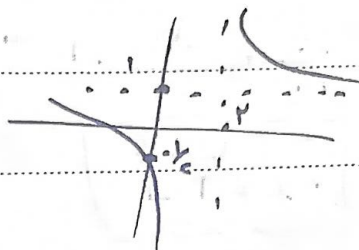


الف) $y: \frac{|x|+1}{|x|-2}$



$\rightarrow R_f: (-\infty, -\frac{1}{2}] \cup (1, +\infty)$

ب) $y: \frac{x^2+1}{|x|} = \frac{|x|+1}{|x|} = 1 + \frac{1}{|x|}$

$|x| > 0 \rightarrow R_f: [2, +\infty)$

$y: \frac{x^2+2x-5}{x+2} \rightarrow y(x+2) = x^2+2x-5 \rightarrow x^2+(2+y)x-5-2y = 0$

$\Delta = \frac{-(2+y)^2 - 4(-5-2y)}{4} \geq 0$

$\Rightarrow y^2+4y+12 \geq 0 \rightarrow (y+2)(y+6) \geq 0$

$\rightarrow R_f: (-\infty, -6] \cup [-2, +\infty)$

$R_f: x^2-x+1 \neq 0 \rightarrow \Delta = -3 \rightarrow \Delta < 0 \rightarrow R_f: (\mathbb{R})$

تمرین ۵: $\frac{(x-k)^r}{(x-\frac{1}{k})^r + \frac{1}{k}}$ $x-k=t \rightarrow \frac{t^r}{t^r + \frac{1}{k}}$ $y \Rightarrow t^r = \frac{-\frac{1}{k}y}{y-1} = \frac{-ky}{ky-k}$

$\rightarrow t^r \geq 0 \rightarrow \frac{-ky}{ky-k} \geq 0 \rightarrow \frac{1}{-k+\frac{1}{k}} \Rightarrow R_f: [0, 1)$

الف) $y = \sqrt{-x^2 + 6x - 1}$ $\xrightarrow{\text{max}} \frac{b}{2a} = \frac{-6}{-2} = 3 \xrightarrow{m=3} -x^2 + 6x - 1 = 0 \Rightarrow x = 1 \text{ (2) } (3)$

$\Rightarrow y = \sqrt{(-\infty, 4]} = [0, \sqrt{4}]$ ✓

ب) $y = \sqrt{2x^2 - 4x}$ $\xrightarrow{\text{min}} \frac{b}{2a} = \frac{-1}{1} = -1 \xrightarrow{m=-1} 2x^2 - 4x = 0 \Rightarrow x = 1$

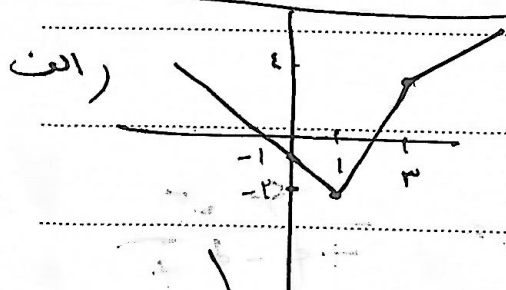
$\Rightarrow y = \sqrt{(-1, +\infty)} = [-1, +\infty)$ ✓

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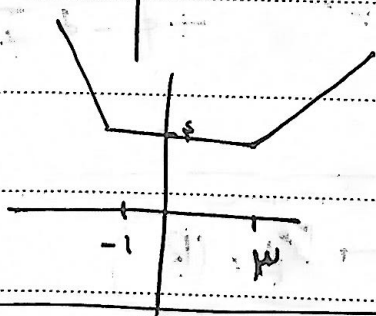
الذ) $x^3 - x + 1$ $\rightarrow R: (-\infty, +\infty)$ (2) (4)

$\rightarrow f_1(x) = (x^3 - x + 1)$ $\rightarrow f_2(x) = f_1(0, +\infty) = (-\infty, +\infty)$ ✓

ب) $\frac{x^2+1}{x} = x + \frac{1}{x}$ $\xrightarrow{x>0} x + \frac{1}{x} \geq 2 \Rightarrow f_1 = [2, +\infty)$ $\Rightarrow f_2 = [1, +\infty)$ ✓



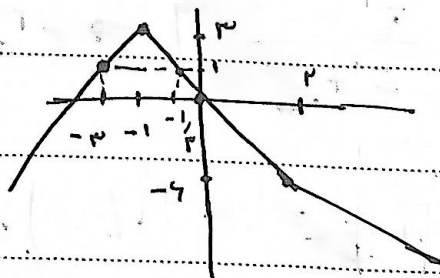
$\Rightarrow R_f: [-1, +\infty)$ (2) (6)



ب) $\rightarrow R_f: [1, +\infty)$ ✓

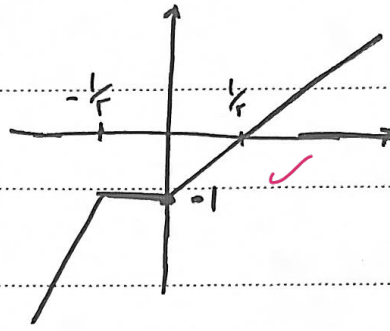
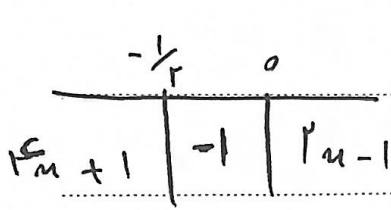
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$-1 \quad 2$
 $x+2 \quad -1 \quad -x-2$



$x+2=1 \rightarrow x=-3$ (2) (7)
 $-x-2=1 \rightarrow x=-3$

$\Rightarrow R_f: (-\infty, -3] \cup [-1/2, +\infty)$ ✓



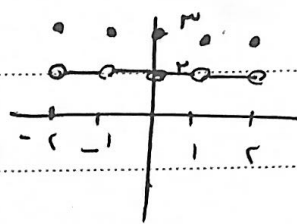
$$R_f: (-\infty, \infty)$$

(2) (1, 1)

الف) $y = [n] + [-n] + r$

(2) (9, 5)

$n \in \mathbb{Z} \rightarrow y = r$
 $n \notin \mathbb{Z} \rightarrow y = r$



$$\Rightarrow R_f: \{r, r\}$$

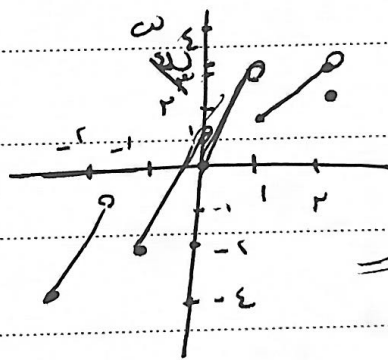
ب) $-2 < n < -1 \rightarrow r_{n+2}$

$-1 < n < 0 \rightarrow r_{n+1}$

$0 < n < 1 \rightarrow r_n$

$1 < n < 2 \rightarrow r_{n-1}$

$n = 2 \rightarrow (r, r) - r = 2$



$$\Rightarrow R_f: [-2, \infty)$$

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الف) $\begin{matrix} \text{sinus} = 1 & 1 - 1 + 1 = 1 \\ \text{cosinus} = -1 & 1 + 1 + 1 = 3 \\ \text{tanus} = 1/2 & 1/2 - 1/2 + 1 = 1/2 \end{matrix}$

$$\Rightarrow R_f: \left[\frac{r}{2}, r \right]$$

(10

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(2)

ب) $\sin^2 z \rightarrow z^2 + z + 1$

$\begin{matrix} z=1 & 1+1+1=3 \\ z=0 & 0+0+1=1 \\ z=-1/2 & \text{X} \end{matrix}$

$$\Rightarrow R_f: [1, 3]$$