

$$yx - y = x^2 + x + 2 \rightarrow y = yx - x^2 - x - 2$$

$$-x^2 + (y-1)x + (2+y) = 0$$

$$\Delta = \sqrt{(y-1)^2 - 4 \times (-1) \times (2+y)} = \sqrt{y^2 - 4y - 7} > 0$$

$$+1 \quad -1 \quad + \rightarrow R_f = [-\infty, 1] \cup [7, +\infty)$$

1

$$\Delta \quad -\frac{b}{2a} = \frac{\omega}{\kappa}$$

$$\rightarrow y = \frac{10}{\kappa} - \frac{10}{\kappa} + 1 = \frac{-14}{\kappa}$$

$$ج) \sqrt{R} = [0, +\infty)$$

$$\left[-\frac{14}{\kappa}, +\infty \right) \quad \begin{cases} \text{ب) } -\frac{4}{\kappa} = 3 \\ -4 + 11 - 5 = 2 \end{cases} \quad \sqrt{(-\infty, \kappa]} = [0, 1]$$

$$\rightarrow R$$

2

$$\begin{cases} 2xy - 4y = 3x + 1 \\ \rightarrow \kappa(2y - 4) = 4y + 1 \end{cases}$$

$$\rightarrow x = \frac{4y+1}{2y-4} \rightarrow R_f = R - \left\{ \frac{1}{2} \right\}$$

$$y = \sqrt{x^2 + 2} \quad \frac{1}{\sqrt{x^2 + 2}} \rightarrow R = \left[\frac{1}{\sqrt{2}}, +\infty \right)$$

$$\begin{cases} \text{ب) } \sqrt{\frac{3x+1}{x-1}} \\ \sqrt{R - \left\{ \frac{1}{2} \right\}} = \sqrt{R - \left\{ \frac{1}{2} \right\}} = [0, +\infty) - \left\{ \frac{1}{2} \right\} \end{cases}$$

$$\begin{cases} \text{ج) } x^2 + 2 + \frac{1}{x^2 + 2} - 2 \\ R_f = [1/2, +\infty) \end{cases}$$

3

$$3x^2 + 2 = yx^2 - y$$

$$yx^2 - 3x^2 = y + 2$$

$$x^2 = \frac{y+2}{y-3}$$

$$\rightarrow x = \sqrt{\frac{y+2}{y-3}}$$

$$R_f = (-\infty, 3] \cup (3, +\infty)$$

$$-4, 2 \quad \text{طبق تذکره}$$

$$\text{در بازه هستند چون خارج صفر}$$

$$R_f = (-\infty, -4] \cup [2, +\infty)$$

$$R_f = (-\infty, -4] \cup [2, +\infty)$$

4

$$y \sin x + 3y = 2 \sin x - 1$$

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

$$\rightarrow -1 \leq \sin x \leq 1 \rightarrow R_f = \left[-\frac{1}{2}, \frac{1}{2} \right]$$

$$-1/2, 1/2 \quad \text{طبق تذکره در بازه}$$

$$\sin x \in [-1, 1] \quad \text{و چون خارج صفر نمی شود}$$

$$در داخل بازه$$

5

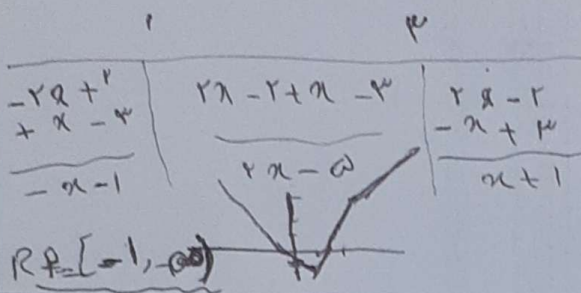
$$f(x) = \frac{(x - 1/r)^2}{(x - 1/r)^2 + \frac{r}{r}}$$

$$D_f = \mathbb{R}$$

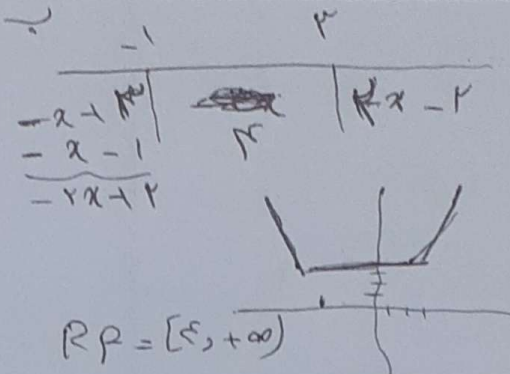
$$IR_f = [0, 1]$$

6

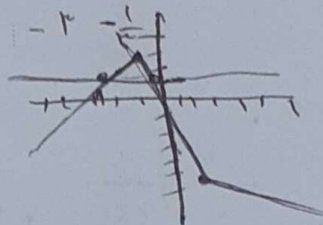
الف)



7



$$\begin{array}{c|c|c} -1 & r & \\ \hline x+r & -rx & -x-r \end{array}$$

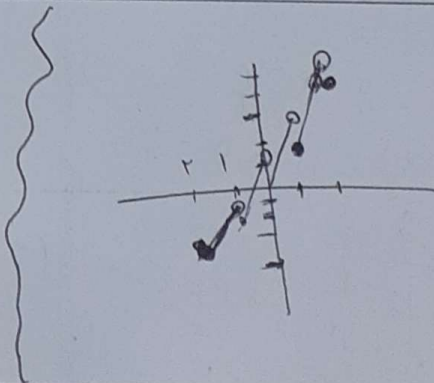
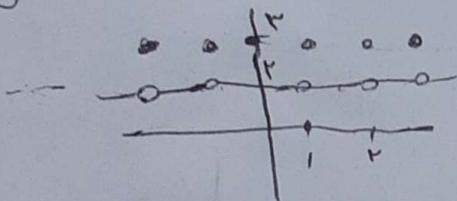


$$\Rightarrow (-\infty, -r] \cup [-\frac{1}{r}, +\infty)$$

8

الف)

$$y = [x] + [-x] + r$$



9

$$\begin{aligned} y &\rightarrow 1 \rightarrow 1+1+1=3 \\ y &\rightarrow 1/r \rightarrow \frac{1}{r} - \frac{1}{r} + 1 = \frac{r}{r} \\ y &\rightarrow -1 \rightarrow 1-1+1=1 \end{aligned}$$

$$IR_f = [\frac{r}{r}, 3]$$

$$\begin{aligned} y &\rightarrow -1 \rightarrow 1+1+1=3 \\ y &\rightarrow -1/r \rightarrow \frac{1}{r} - \frac{1}{r} + 1 = \frac{r}{r} \\ y &\rightarrow 1 \rightarrow 1+1+1=3 \end{aligned}$$

$$IR_f = [\frac{r}{14}, 3]$$

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