

الف) $y = \frac{|x|+1}{|x|-2} \rightarrow |x| = -\frac{-y-1}{y-1} = \frac{y+1}{y-1} \rightarrow \frac{y+1}{y-1} > 0 \rightarrow \frac{1}{-1-\frac{1}{y-1}}$ (1)

$R_f = R - (-\frac{1}{y-1})$

ب) $y = \frac{x^2+1}{|x|} = \frac{|x|^2+1}{|x|} = |x| + \frac{1}{|x|} \xrightarrow{a>0} R_f = [2, +\infty)$

$y = \frac{x^2+2x-2}{x+3} \xrightarrow{\text{مخرج وین}} yx + y = x^2 + 2x - 2 \rightarrow x^2 + (2-y)x - (2+3y) = 0$ (2)

$x = \frac{y-2 \pm \sqrt{\Delta}}{1} \rightarrow \Delta = (2-y)^2 - 4(-2-3y) = y^2 + 4y + 12 = (y+2)(y+6)$

$\Delta > 0 \rightarrow \frac{-4 \pm \sqrt{16-12}}{2} \rightarrow R_f = [2, +\infty)$

$f(x) = \frac{x^2-x+\frac{1}{x}}{x^2-x+1} \xrightarrow{\text{مخرج وین}} yx^2 - yx + y = x^2 - x + \frac{1}{x} \rightarrow (y-1)x^2 + (1-y)x + y - \frac{1}{x} = 0$ (3)

$x = \frac{y-1 \pm \sqrt{\Delta}}{2(y-1)} \rightarrow \Delta > 0 \rightarrow (1-y)^2 - 4(y-1)(y-\frac{1}{x}) > 0 \rightarrow -4y^2 + 4y > 0 \rightarrow \frac{0}{-4+4} = 0$

$y-1 \neq 0 \rightarrow y \neq 1 \Rightarrow \text{D, D} \rightarrow R_f = [0, 1)$

ب) : $x^2 - x + 1 \neq 0 \rightarrow D_f = R$

الف) $y = \sqrt{-x^2+6x-1}$ $\text{max} \left| \frac{-b}{2a} = 3 \right| \rightarrow \text{در عبارت زیر رادیکال} : (-\infty, 3] \xrightarrow{\sqrt{}} R_f = [0, \sqrt{3}]$ (4)

ب) $y = \sqrt[3]{x^2-x}$ $\text{min} \left| \frac{-b}{2a} = \frac{1}{2} \right| \rightarrow \text{در عبارت زیر رادیکال} : [-1, +\infty) \xrightarrow{\sqrt[3]{}} R_f = [-2, +\infty)$

الف) $y = \log(x^2-x+1)$ چون کبریتین دهن عبارت حقیقی و فرد است $\rightarrow \log IR \rightarrow R_f = IR$ (5)

ب) $y = \log_2\left(\frac{x^2+1}{x}\right)$ $\text{بر عبارت حقیقی} : \frac{x^2+1}{x} = x + \frac{1}{x} \xrightarrow{\text{تابع زوجی تابع مثبت}} = [2, +\infty) \rightarrow \log [2, +\infty) \rightarrow R_f = [1, +\infty)$

الف) $y = |2x-1| - |x-3|$

$\begin{array}{c|c|c} & 1 & 3 \\ \hline -2x+2+1-3 & 2x-2+2-3 & 2x-2-x+3 \\ \hline = -x-1 & = x-3 & = x+1 \end{array}$

(2) (4)

(6) $R_f = [-2, +\infty)$

ب) $y = |x-3| + |x+1|$ تابع قطعی

$R_f = [4, +\infty)$

$$|n-r| - |n+r| \leq 1$$

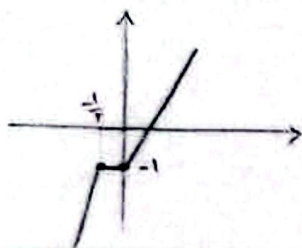
$-n+r+n+r \leq 1$ $n+r \leq 1 \rightarrow n \leq 1-r$ $(-\infty, 1-r]$	$-n+r-n-r \leq 1$ $-2n \leq 1$ $n \geq -\frac{1}{2}$ $[-\frac{1}{2}, +\infty)$	$n-r-n-r \leq 1$ $-n-r \leq 1$ $n \geq -1$ ✓
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$$\Rightarrow \boxed{n \in (-\infty, 1-r] \cup [-\frac{1}{2}, +\infty)}$$

$$y = r_n - |n+1| + |n|$$

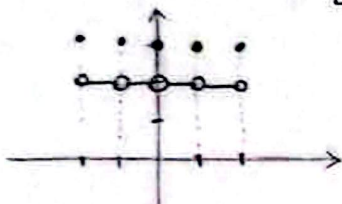
$r_n + r_{n+1} - n$ $= r_{n+1}$	$r_n - r_{n+1} - 1 - n$ $= -1$	$r_n - r_{n+1} - 1 + n$ $= r_{n+1} - 1$
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$$\boxed{R_f = \mathbb{R}}$$



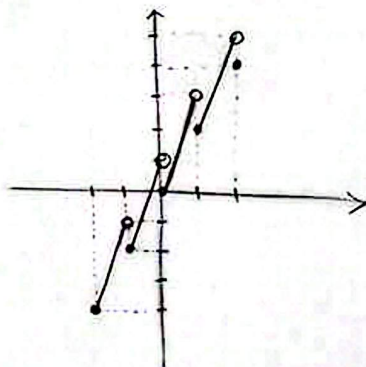
$$a) y = [n] + \frac{[r-n]}{[-n]+r} = [n] + [-n] + r = \begin{cases} -1+r=r & ; n \notin \mathbb{Z} \\ 0+r=r & ; n \in \mathbb{Z} \end{cases}$$

$$\boxed{R_f = \{r\}}$$



$$b) y = r_n - [n]$$

$$\begin{aligned} -r \leq n < -1 &\rightarrow y = r_n + r \\ -1 \leq n < 0 &\rightarrow y = r_n + 1 \\ 0 \leq n < 1 &\rightarrow y = r_n \\ 1 \leq n < r &\rightarrow y = r_n - 1 \\ n = r &\rightarrow y = r \end{aligned}$$



$$R_f = [-r, \infty)$$

$$a) y = \sin^n x - \sin x + 1$$

$$\left. \begin{aligned} \sin^n x = 1 &\rightarrow y = 1 \\ \sin^n x = -1 &\rightarrow y = r \\ \sin^n x = \frac{1}{r} = \frac{-b}{ra} &\rightarrow y = \frac{r}{r} \end{aligned} \right\} \Rightarrow \boxed{R_f = [\frac{r}{r}, r]}$$

$$b) y = \sin^n x + \sin^n x + 1$$

$$\left. \begin{aligned} \sin^n x = 1 &\rightarrow y = r \\ \sin^n x = 0 &\rightarrow y = 1 \\ \sin^n x = \frac{-b}{ra} = \frac{1}{r} &\rightarrow y = \frac{r}{r} \end{aligned} \right\} \Rightarrow \boxed{R_f = [1, r]}$$