

ا) $y = \frac{|x|+1}{|x|-2} \rightarrow \begin{cases} \text{مقدار صفر} = 0 \rightarrow y = -\frac{1}{2} \\ \text{مقدار صفر} = +\infty \rightarrow y = 1 \end{cases} \Rightarrow R_y = (-\infty, -\frac{1}{2}) \cup (\frac{1}{2}, +\infty)$

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

$y = \frac{x^2+2x-2}{x+3} \rightarrow yx+3y = x^2+2x-2 \rightarrow x^2+(2-y)x-(2+3y) = 0$
 $x = \frac{-(2-y) \pm \sqrt{(2-y)^2 + 4(2+3y)}}{2} \geq 0 \rightarrow (2-y)^2 + 4(2+3y) \geq 0 \rightarrow y^2-4y+4+8+12y \geq 0 \Rightarrow$

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$y^2+8y+12 \geq 0 \rightarrow (y+2)(y+6) \geq 0$
 $\begin{cases} y = -2 \\ y = -6 \end{cases}$
 $\frac{-4}{+4} - \frac{-2}{-6} \rightarrow R_y = \mathbb{R} - (-4, -2)$

$f(x) = \frac{x^2-x+\frac{1}{4}}{x^2-x+1}$
 $x^2-x+1 \neq 0 \rightarrow \Delta = 1-4(1)(1) = -3 < 0 \rightarrow$ مخرج نمی تواند صفر شود پس حدود در آنجا نداریم
 $D_f = \mathbb{R}$

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$\hookrightarrow f(x) = \frac{(x-\frac{1}{2})^2}{(x-\frac{1}{2})^2 + \frac{3}{4}} \rightarrow f(x) = \frac{\square^2}{\square^2 + \frac{3}{4}} \rightarrow \begin{cases} \square^2 = 0 \rightarrow y = 0 \\ \square^2 = +\infty \rightarrow y = 1 \end{cases}$
 $\Rightarrow R_f = [0, 1)$

ا) $y = \sqrt{-x^2+4x-1} \rightarrow y_{\max} = \frac{-\Delta}{4a} = \frac{-(14-4(-1)(-1))}{-4} = 3 \Rightarrow R_y = \sqrt{[-\infty, 3]} \rightarrow R_y = [0, 3]$

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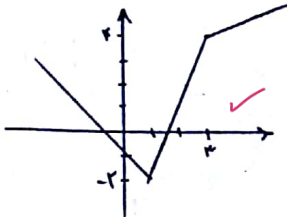
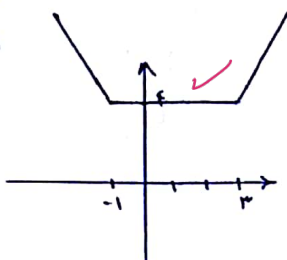
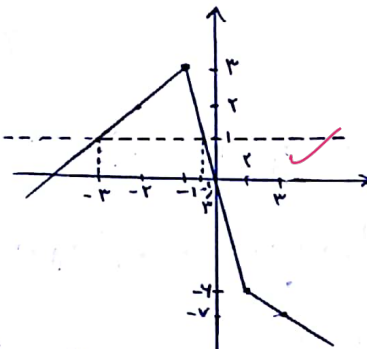
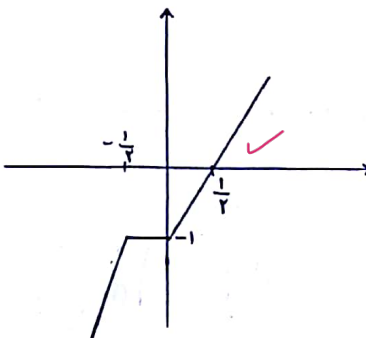
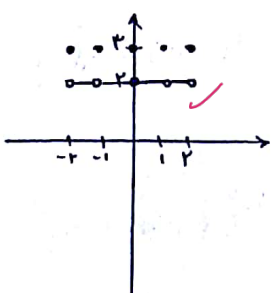
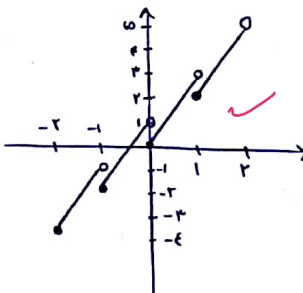
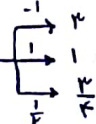
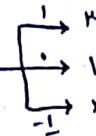
ب) $y = \sqrt[3]{2x^2-18x} \rightarrow y_{\min} = \frac{-\Delta}{4a} = \frac{-(96-4(2)(0))}{12} = -4 \Rightarrow R_y = \sqrt[3]{[-\infty, +\infty)} \rightarrow R_y = [-4, +\infty)$

ا) $y = \log(\underbrace{x^2-x+18}_{\text{خیزد به بالا و صفر ندارد}}) \rightarrow R_y = \log(-\infty, +\infty) = \mathbb{R}$

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ب) $y = \log_r(\frac{x^2+1}{x})$
 $\frac{x^2+1}{x} = x + \frac{1}{x} \begin{cases} x + \frac{1}{x} \geq 2 \\ x + \frac{1}{x} \leq -2 \end{cases} \rightarrow R = (-\infty, -2] \cup [2, +\infty)$
 $R_y = [1, +\infty)$
 $\log_r$

u) $y = x-1 - x-2$ $\begin{cases} x+1 & x > 2 \\ x-2 & 1 \leq x \leq 2 \\ -x-1 & x < 1 \end{cases}$  $R_y = [-1, +\infty)$	v) $y = x-2 + x+1$ $\begin{cases} x+2 & x > 2 \\ x-1 & -1 \leq x \leq 2 \\ -x+2 & x < -1 \end{cases}$  $R_y = [1, +\infty)$	2 6
$x-2 - x+2 \leq 1$ $\begin{cases} -x-2 & x > 2 \\ -x & -1 \leq x \leq 2 \\ x+2 & x < -1 \end{cases}$  $(-\infty, -2] \cup [-\frac{1}{2}, +\infty)$		2 7
$y = 2x - x+1 + x$ $\begin{cases} x-1 & x > 0 \\ -1 & -\frac{1}{2} \leq x \leq 0 \\ 2x+1 & x < -\frac{1}{2} \end{cases}$  $R_f = \mathbb{R}$	2 8	
u) $y = [x] + [2-x] \rightarrow y = [x] + [-x] + 2$ $\begin{cases} 2 & x \in \mathbb{Z} \\ 1 & x \notin \mathbb{Z} \end{cases}$  $R_y = \{1, 2\}$	v) $y = 2x - [x]$ $\begin{cases} x-2 & x=2 \\ x-1 & 1 \leq x < 2 \\ x & 0 \leq x < 1 \\ x+1 & -1 \leq x < 0 \\ x+2 & -2 \leq x < -1 \end{cases}$  $R_y = [-2, \infty)$	2 9
u) $y = \sin^2 x - \sin x + 1 \rightarrow \square = \sin x$  $R_y = [\frac{4}{9}, 2]$	v) $y = \sin^2 x + \sin^2 x + 1 \rightarrow \square = \sin^2 x$  $R_y = [1, 2]$	2 10