

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

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

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

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

$R_y = ? \rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-b \pm \sqrt{(2-y)^2+12+6y}}{2} \in \mathbb{R} \geq 0$

$\rightarrow y^2-4y+4+12+6y = y^2+2y+16 \geq 0 \rightarrow y = \frac{-1 \pm \sqrt{4-16}}{2} = \frac{-1 \pm 2i}{2}$

$\rightarrow R_x = R_y = (-\infty, -4] \cup [-2, +\infty)$

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

$x^2-x+1 \rightarrow \Delta < 0 \quad a > 0 \rightarrow +\infty$

$R_f = ? \rightarrow 0 \neq \text{جزء} \rightarrow R_f = \mathbb{R} \rightarrow x = \frac{-b \pm \sqrt{\Delta}}{2a}$

$R_x = R_y \rightarrow D_x = \Delta \geq 0 \rightarrow \Delta = (y-1)^2 - 4(1-y)(\frac{1}{2}-y) = y^2-1-2y+4y-4y^2+4y = -3y^2+3y \geq 0$

$\rightarrow 3y(-y+1) \geq 0 \rightarrow R_f = [0, 1]$

الف) $y = \sqrt{-x^2+4x-1} \rightarrow \text{ext} \begin{cases} -\frac{4}{4} = -1 \\ -4+4-1 = -1 \end{cases} R_f = \sqrt{(-\infty, 3]} = [0, \sqrt{3}]$

ب) $y = \sqrt[3]{2x^2-11x} \rightarrow R = [-\frac{11}{2}, +\infty) \rightarrow \text{ext} \begin{cases} \frac{11}{2} = 5.5 \\ -11 \end{cases} \rightarrow \sqrt[3]{[-11, +\infty)}$

$\Rightarrow R_y = [-2, +\infty)$

الف) $y = \log(x^2-x+11) \rightarrow x \cdot x^2-x+11 \rightarrow \text{محدوده تعریف} \rightarrow \mathbb{R}$

$\rightarrow \log_{10} \mathbb{R} \rightarrow \log_{10} (0, +\infty) \Rightarrow R_f = \mathbb{R} (-\infty, +\infty)$

ب) $y = \log_r(\frac{x^2+1}{x}) \rightarrow \log_r(x+\frac{1}{x}) \rightarrow \begin{cases} x+\frac{1}{x} > 0 \rightarrow [2, +\infty) \\ x+\frac{1}{x} < 0 \rightarrow (-\infty, -2] \end{cases} \rightarrow R = (-\infty, -2] \cup [2, +\infty)$

$\rightarrow \log_r [2, +\infty) \rightarrow R_f = [1, +\infty)$

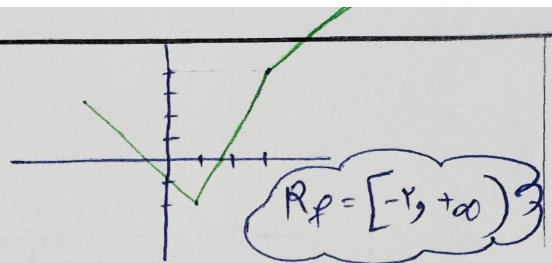
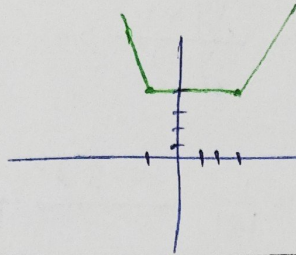
$$a) y = \underbrace{|x-2|}_{m=1} - \underbrace{|x-3|}_{m=2}$$

$$\begin{array}{c} 1 \qquad 2 \\ \hline -x+2+m-1 \quad |x-2+m-1| \quad x-2-m+2 \\ \hline \end{array}$$

$$b) y = |x-2| + |x+1| \xrightarrow{\text{ثلاثية}}$$

$$\downarrow m=2 \quad \downarrow m=-1$$

← ثلاثية



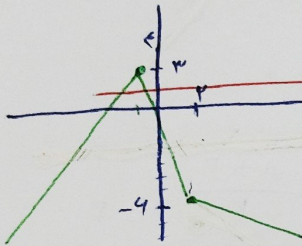
$$R_f = [-2, +\infty)$$

$$R_f = [-1, +\infty)$$

$$|x-2| - |x+2| \leq 1$$

$$\downarrow m=2 \quad \downarrow m=-1$$

$$\begin{array}{c} m=-1 \qquad \qquad m=2 \\ \hline -x+2+x+2 \quad |x-2-x-2| \quad x-2-x-2 \\ \hline x+4 \quad -4 \quad -x-4 \end{array}$$



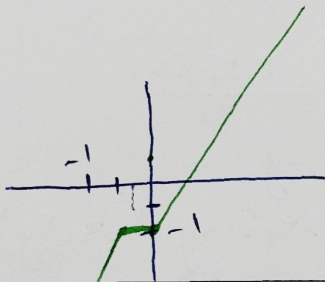
$$\begin{cases} x+4 \leq 1 \rightarrow x \leq -3 \\ -x-4 \leq 1 \rightarrow x \geq -5 \end{cases}$$

$$R_f = (-\infty, -3] \cup [-5, +\infty)$$

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

$$\downarrow m=-\frac{1}{2} \quad \downarrow m=0$$

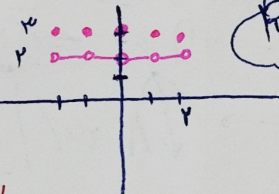
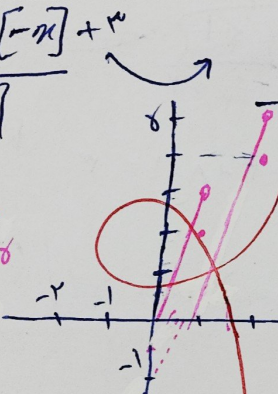
$$\begin{array}{c} -\frac{1}{2} \qquad 0 \\ \hline 3x+x+1-m \quad |x-x-1-m| \quad 3x-x-1+m \\ \hline 4x+1 \quad -1 \quad 2x-1 \end{array}$$



$$R_f = \mathbb{R}$$

$$a) y = [x] + [3-x] \rightarrow [x] + [-x] + 3$$

$$b) y = 3x - [x] \begin{cases} x \rightarrow 2x \\ x^+ \rightarrow 2x \\ x^- \rightarrow 2x-1 \end{cases}$$



$$R_f = \{2, 3\}$$

$$R_f = [-1, \infty)$$

$$a) y = \sin^2 x - \sin x + 1 \rightarrow a \square^2 + b \square + c$$

$$R_f = [\frac{7}{4}, 3]$$

$$\begin{cases} \Delta x = +1 \rightarrow 1 \\ \Delta x = -1 \rightarrow 3 \rightarrow \max \\ -\frac{b}{2a} = \frac{1}{2} \rightarrow \frac{7}{4} \rightarrow \min \end{cases}$$

$$b) y = \sin^2 x + \sin x + 1 \rightarrow \Delta x = 0$$

$$R_f = [1, 3]$$

$$\begin{cases} \Delta x = +1 \rightarrow 3 \rightarrow \max \\ \Delta x = 0 \rightarrow 1 \rightarrow \min \\ \Delta x = -\frac{b}{2a} = -\frac{1}{2} \times \text{غير موجود} \end{cases}$$