

الف) $x^2 = y + 4 \rightarrow x = \pm \sqrt{y + 4} \rightarrow y + 4 \geq 0 \rightarrow y \geq -4 \Rightarrow R_f = [-4, +\infty)$ (سوال ۱)

ب) $x^3 = y - 1 \rightarrow x = \sqrt[3]{y - 1} \rightarrow R_f = \mathbb{R}$ (نرخ فرد)

الف) $x^2 - 4x + 2 - y = 0 \rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow x = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(2-y)}}{2} \Rightarrow$ (سوال ۲)
 زیر اکیال فرض زوج ی.

$16 - 16 + 4y \geq 0 \rightarrow 4y \geq 0 \rightarrow y \geq 0 \Rightarrow R_f = [0, +\infty)$

ب) $x^2 - 4x + 1 - y = 0 \rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow x = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(1-y)}}{2} \Rightarrow$ زیر اکیال فرض زوج ی.

$16 - 16 + 4y \geq 0 \rightarrow 4y \geq -4 \rightarrow y \geq -1 \Rightarrow R_f = [-1, +\infty)$

الف) $y = \frac{x^2 + 3}{x^2 - 2} \rightarrow yx^2 - 2y = x^2 + 3 \rightarrow yx^2 - x^2 = 3 + 2y \rightarrow x^2 = \frac{3 + 2y}{y - 2} \rightarrow x = \pm \sqrt{\frac{3 + 2y}{y - 2}}$ (سوال ۳)

$R_f = (-\infty, -\frac{3}{2}] \cup (1, +\infty)$

ب) $y = \frac{2|x| + 1}{|x| - 4} \rightarrow y|x| - 4y = 2|x| + 1 \rightarrow |x|(y - 2) = 1 + 4y \rightarrow |x| = \frac{1 + 4y}{y - 2}$

$R_f = (-\infty, -\frac{1}{4}] \cup (2, +\infty)$

$y = \frac{1}{x^2 - 4x} \rightarrow yx^2 - 4yx - 1 = 0$

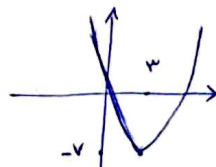
$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{4y \pm \sqrt{(-4y)^2 - 4(1)(-1)}}{2(1)} = \frac{4y \pm \sqrt{16y^2 + 4}}{2} \Rightarrow$ (سوال ۴)
 زیر اکیال فرض زوج ی.

$16y^2 + 4y \geq 0$
 $4y(4y + 1) \geq 0$
 $4y \neq 0$
 $4y \neq 0$
 $y \neq 0$

$R_f = (-\infty, -\frac{1}{4}] \cup (0, +\infty)$

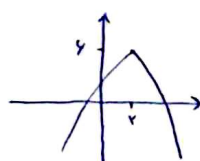
الف) $\text{Min} \left| \begin{array}{l} -\frac{b}{2a} = \frac{4}{2} = 2 \\ 3^2 - 4(2) + 2 = -7 \end{array} \right.$



$R_f = [-7, +\infty)$

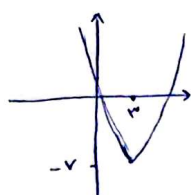
(سوال ۵)

ب) $\text{Max} \left| \begin{array}{l} \frac{b}{2a} = \frac{-4}{-2} = 2 \\ -2^2 + 4(2) + 2 = 6 \end{array} \right.$



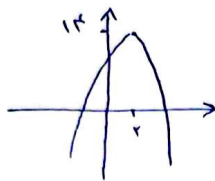
$R_f = (-\infty, 6]$

الف) $\text{Min} \left| \begin{array}{l} \frac{-b}{2a} = \frac{y}{2} = 2 \\ 3^2 - 2(2) + 2 = -1 \end{array} \right.$



$R_f = \sqrt{[-1, +\infty)} \Rightarrow R_f = [0, +\infty)$ (سوال ٦)

ب) $\text{Max} \left| \begin{array}{l} \frac{-b}{2a} = \frac{-4}{-2} = 2 \\ -2^2 + 2(2) + 1 = 1 \end{array} \right.$



$R_f = \sqrt{(-\infty, 1]} \rightarrow R_f = [0, \sqrt{1}]$

الف) $R_f = \mathbb{R}$

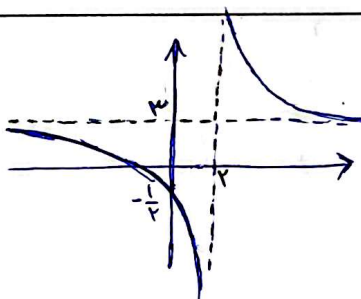
ب) $R_f = \sqrt{\mathbb{R}} \rightarrow R_f = [0, +\infty)$

(سوال ٧)

الف) $R_f = \mathbb{R} - \left\{ \frac{3}{2} \right\} = \mathbb{R} - \left\{ \frac{3}{2} \right\}$
 $\frac{a}{c}$

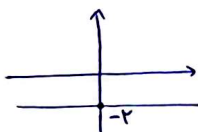
ب) $R_f = \sqrt{\mathbb{R} - \left\{ \frac{3}{2} \right\}} \rightarrow R_f = [0, +\infty) - \left\{ \frac{3}{2} \right\}$ (سوال ٨)

الف) $\left\{ \begin{array}{l} 2 \Rightarrow \text{ریشه ی منبج} = \text{مجاوب مالم} \\ 3 \Rightarrow \text{مجاوب انتی} = \frac{a}{c} \\ 3 \Rightarrow \frac{a}{c} \end{array} \right.$
 ب) $\frac{1}{2}$ صفر



(سوال ٩)

ب) $y = \frac{2x-2}{1-2x} = \frac{-2(-x+1)}{(-2x+1)} = -2$



الف) $y = \cos^2 x + \frac{1}{\cos^2 x} \rightarrow a + \frac{1}{a}, a > 0 \Rightarrow R_f = [2, +\infty)$

(سوال ١٠)

ب) $y = \sqrt[3]{\frac{x^2}{x} + \frac{1}{x}} = \sqrt[3]{x + \frac{1}{x}} \rightarrow \sqrt[3]{(-\infty, -2] \cup [2, +\infty)} \Rightarrow R_f = (-\infty, \sqrt[3]{-2}] \cup [\sqrt[3]{2}, +\infty)$