

الف) $y = \underbrace{x^3 - 3x^2 + 3x - 1}_{(x-1)^3} + 1 \Rightarrow y = (x-1)^3 + 1 \rightarrow y-1 = (x-1)^3 \Rightarrow$

$x-1 = \sqrt[3]{y-1} \rightarrow x = \sqrt[3]{y-1} + 1 \Rightarrow R_f = \mathbb{R}$

ب) $y x^2 - 2yx = 1 \rightarrow y x^2 - 2yx - 1 = 0 \quad x = \frac{2y \pm \sqrt{4y^2 + 4y}}{2y} \geq 0$

$4y^2 + 4y \geq 0 \rightarrow y(y+1) \geq 0 \Rightarrow y \in (-\infty, -1] \cup [0, +\infty) \rightarrow R_f = [0, +\infty)$

الف) $\frac{-\Delta}{\epsilon a} \Rightarrow \frac{4(1)(10) - 16}{\epsilon} = \frac{4}{\epsilon}, \quad a > 0 \Rightarrow R_f = [4, +\infty)$

ب) $\frac{-\Delta}{\epsilon a} \Rightarrow \frac{4(-1)(3) - 36}{-\epsilon} = 12, \quad a < 0 \Rightarrow R_f = (-\infty, 12]$

ج) $\frac{-\Delta}{\epsilon a} = \frac{4(1)(-3) - 12}{\epsilon} = -7, \quad a > 0$

د) $\frac{-\Delta}{\epsilon a} = \frac{4(-1)(0) - 36}{-\epsilon} = 9, \quad a < 0$

$\sqrt{[-7, +\infty)} \Rightarrow [0, +\infty)$

$\sqrt{-x^2 + 4x} \Rightarrow \sqrt{(-\infty, 9]} \Rightarrow [0, 3]$

الف) $R_f = \mathbb{R}$

ب) $R_f = \mathbb{R}$

ج) $\sqrt{\mathbb{R}} \stackrel{R_f}{=} [0, +\infty)$

د) $R_f = \mathbb{R}$

الف) $R_f = \mathbb{R} - \{3\}$

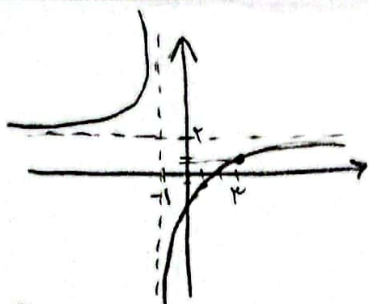
ب) $R_f = \mathbb{R} - \{2\}$

الف) $\sqrt{\mathbb{R} - \{2\}} \Rightarrow [0, +\infty) - \{\sqrt{2}\}$

ب) $\sqrt{\mathbb{R} - \{3\}} \Rightarrow [0, +\infty)$

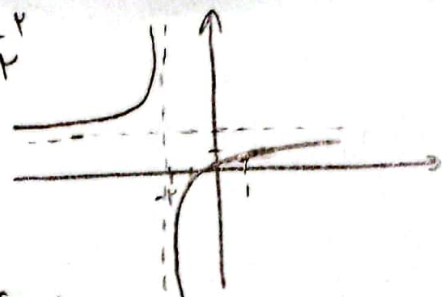
$y = \frac{3x+1}{-x+2} \quad y \neq -3$

الف) $x = -1$
 $y = 2$



نقطه
مقطع $\Rightarrow \begin{cases} x = 3 \\ y = \frac{3}{2} \end{cases}$

ب) $x = -2$
 $y = 2$



نقطه
مقطع $\Rightarrow \begin{cases} x = 1 \\ y = \frac{1}{2} \end{cases}$

الف) $\sin x \leq 1 \Rightarrow R_f = (-\infty, -2] \cup [2, +\infty)$

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

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

د) $R_f = [2, +\infty)$

الف) $y = x^2 + 3 + \frac{1}{x^2 + 3} - 3$

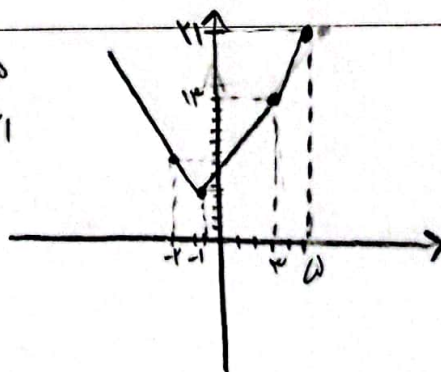
ب) $\frac{1}{x^2 + 3} \geq 0 \Rightarrow [0, +\infty) - 3 = [-3, +\infty) = R_f$

ج) $\frac{x^2 + 5 + 1}{\sqrt{x^2 + 5}} = \sqrt{x^2 + 5} + \frac{1}{\sqrt{x^2 + 5}} \Rightarrow [\frac{6}{\sqrt{5}}, +\infty)$

د) $x = 3 \Rightarrow 3x + 5 = 0 \Rightarrow x = -\frac{5}{3}$

$\frac{-5}{3} \quad 3$
 $-3x - 1 \quad 3x + 1$
 $(\frac{15}{3}) \quad (13)$

$R_f = [\frac{13}{3}, +\infty)$



$x = 2 / x = -1$

الف

$-1 \quad 2$
 $-3x \quad x + 5 \quad 3x$
 $(3) \quad (4)$

$\frac{-2}{3} \quad \frac{-1}{3} \quad \frac{1}{3} \quad \frac{2}{3}$

$R_f = [3, +\infty)$



$x = 1 \quad x = -1$

ب

$-1 \quad 1$
 $-3x + 1 \quad -3x + 1 \quad x - 3$
 $(4) \quad (2)$

$\frac{-2}{3} \quad \frac{-1}{3} \quad \frac{1}{3} \quad \frac{2}{3}$

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

