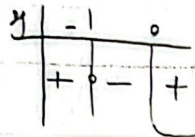


الف) $y = (x-1)^3 + 1 \rightarrow (x-1)^3 = y-1 \rightarrow x-1 = \sqrt[3]{y-1} \rightarrow x = \sqrt[3]{y-1} + 1, R_f = \mathbb{R}$

ب) $yx^2 - 4x - y = 1 \rightarrow yx^2 - 4x - y - 1 = 0, \Delta = 16y^2 + 4y \geq 0 \rightarrow 4y(y+1) \geq 0 \Rightarrow y = 0, -1$



صورت کسر 1 است
در نتیجه خطگاه
مانی دهی

$R_f = (-\infty, -1] \cup (0, +\infty)$

الف) $x = \frac{y}{y+4} = \frac{y}{y+4} = 2, y = 4 \Rightarrow R_f = [4, +\infty)$

ب) $x = \frac{y}{y+4} = 3, y = -9 + 12 = 3 \Rightarrow R_f = (-\infty, 3]$

ج) $x = \frac{y}{y+4} = 2, y = 4 - 8 = -4 \Rightarrow R_f = \sqrt{[-4, +\infty)} = [0, +\infty)$

د) $x = \frac{y}{y+4} = 3, y = 9 \Rightarrow R_f = \sqrt{(-\infty, 9]} = [0, 3]$

الف) $R_f = \mathbb{R}$ ب) $R_f = \mathbb{R}$

ج) $x^2 - 4x^2 + 5x + 1 \geq 0 \Rightarrow R_f = [0, +\infty)$

د) $R_f = [0, +\infty)$ همه ضرایب توان 2 میباشند پس همواره مثبت است

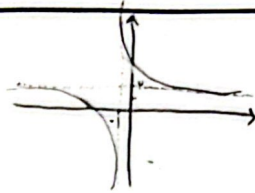
الف) $y = \frac{3x+1}{x-2}, -4 \neq 1 \Rightarrow R_f = \mathbb{R} - \{3\}$

ب) $y = \frac{2x+1}{x+1}, 2 \neq 1 \Rightarrow R_f = \mathbb{R} - \{2\}$

الف) $y = \sqrt{\frac{2x+4}{x+1}}, \frac{2x+4}{x+1} \geq 0 \Rightarrow R_f = [0, +\infty) - \{\sqrt{2}\}$

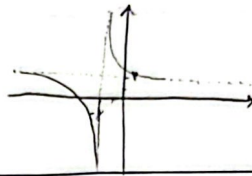
ب) $y = \sqrt{\frac{3x-1}{-x+2}}, \frac{3x-1}{-x+2} \geq 0 \Rightarrow R_f = [0, +\infty)$

الف) $y = 2$: جانب اعلى و $x = -1$: جانب يمين



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ب) $y = 2$: جانب اعلى و $x = -2$: جانب يمين



الف) $R_f = (-\infty, -2] \cup [2, +\infty)$

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

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

د) $\sqrt{x} + \frac{1}{\sqrt{x}} \rightarrow R_f = [2, +\infty)$

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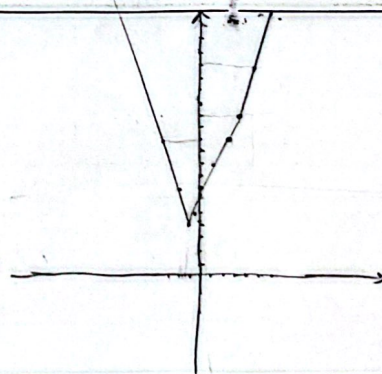
الف) $x^3 = k \rightarrow k + \frac{1}{k+3} \rightarrow \frac{k(k+3)+1}{k+3} = \frac{k^2+3k+1}{k+3} = y \rightarrow yk+3y = k^2+3k+1 \rightarrow k^2+3k+1-yk-3y=0$
 $k^2+k(3-y)+1-3y=0 \quad \Delta = (3-y)^2 - 4(1-3y) = y^2+4y+5 = (y+1)(y+5) = 0 \quad y = -1, -5$

$\frac{y}{+} \frac{-5}{+} \frac{-1}{+}$ $R_f = (-\infty, -5] \cup [-1, +\infty)$

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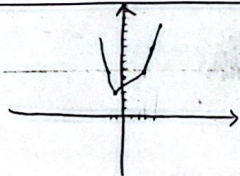
ب) $y = \sqrt{x^2+4} + \frac{1}{\sqrt{x^2+4}}$ ، $\sqrt{x^2+4}$: كثرين عدد $\sqrt{4} = 2$ ، $2 + \frac{1}{2} = \frac{5}{2}$ $R_f = [\frac{5}{2}, +\infty)$

$$f(x) = \begin{cases} x-3+3x+4 = 4x+1 & x > 3 \\ 3-x+3x+4 = 2x+7 & -\frac{4}{3} \leq x \leq 3 \\ 3-x-3x-4 = -4x-1 & x < -\frac{4}{3} \end{cases}$$



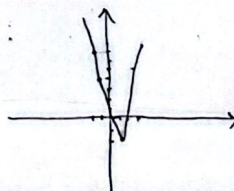
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الف) $\frac{-1}{-3x} \mid \frac{2}{x+4} \mid \frac{3}{3x}$



$R_f = [3, +\infty)$

ب) $\frac{-1}{-3x+1} \mid \frac{1}{-x+3} \mid \frac{1}{3x-1}$



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

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