

$$y = x^3 - 3x^2 + 3x - 1 + 1 \rightarrow y = (x-1)^3 \rightarrow x = \sqrt[3]{y+1}$$

$$\hookrightarrow R_f = \mathbb{R}$$

$$y = \frac{1}{x^2 - 2x} \rightarrow (x-1)^2 - 1 = \frac{1}{y} \rightarrow x-1 = \sqrt{\frac{y+1}{y}}$$

$$\rightarrow x = \sqrt{\frac{y+1}{y}} + 1 \rightsquigarrow \frac{-1}{+ \phi - \phi} + R_f = (-\infty, -1] \cup (0, +\infty)$$

الف) $R_f = [\frac{1}{9}, +\infty)$

ب) $R_f = (-\infty, -\frac{9+1+1}{12}]$

ج) $R_{\text{زیر}} = [\frac{1}{9}, +\infty) \rightarrow R_f = [0, +\infty)$

د) $R_{\text{زیر}} = (-\infty, \frac{9+1+1}{9}] \rightarrow R_f = [0, 3]$

الف) $y = x^3 - 8x^2 + 2x + 1$

$\hookrightarrow R_f = \mathbb{R}$

ب) $x^3 - 4x^2 + 2x + 1$

$\hookrightarrow R_f = \mathbb{R}$

ج) $\sqrt{x^3 - 4x^2 + 8x + 1} \rightarrow y \in \{\sqrt{n} \mid n \in \mathbb{R}\} \rightarrow R_f = [0, +\infty)$

د) $y = (x^3 - 4x^2 + 2x + 1)^2 \rightarrow y \in \{n^2 \mid n \in \mathbb{R}\} \rightarrow R_f = [0, +\infty)$

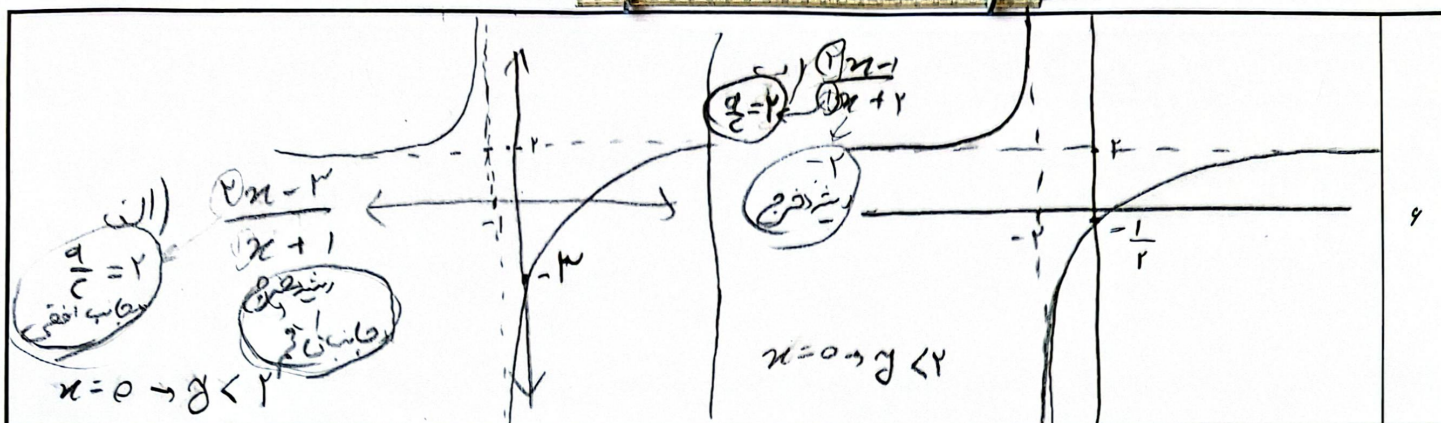
الف) $y = \frac{2x+1}{2x-1} \rightarrow R_f = \mathbb{R} - \{1\}$

ب) $\frac{2x+1}{2x+1}$

$\hookrightarrow R_f = \mathbb{R} - \{1\}$

الف) $y = \sqrt{\frac{2x+1}{x+1}} \rightarrow R_{\text{زیر}} = \mathbb{R} - \{-1\} \rightarrow R_f = [0, \sqrt{2}) \cup (\sqrt{2}, +\infty)$

ب) $y = \sqrt{\frac{2x+1}{x-1}} \rightarrow R_{\text{زیر}} = \mathbb{R} - \{-1\} \rightarrow R_f = [0, +\infty)$



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

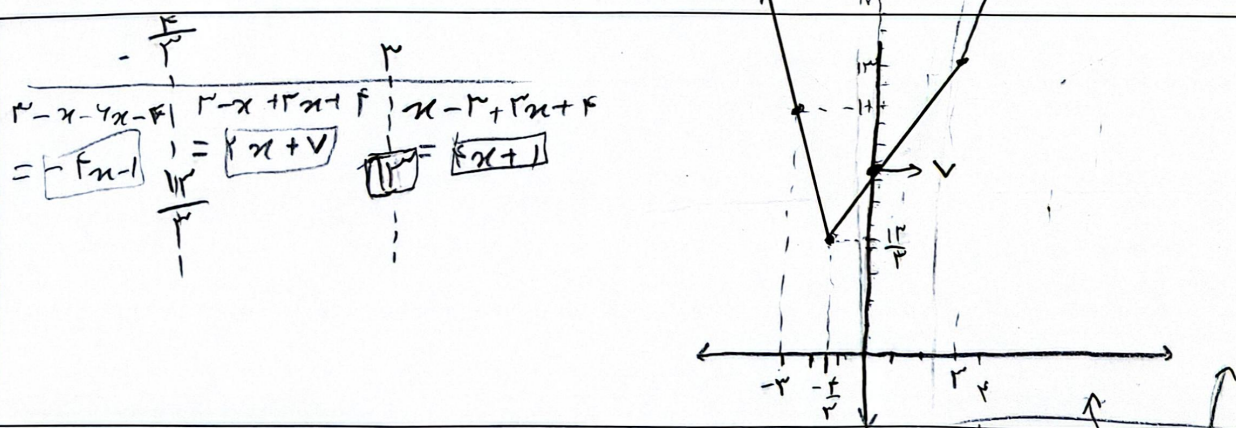
ب) $x^r + \frac{1}{x^r} \rightarrow -\infty < x^r < \infty \Rightarrow R_f = (-\infty, -r] \cup [r, +\infty)$

ج) $\sqrt{x} + \frac{1}{\sqrt{x}} \sim -\infty < \sqrt{x} < \infty \Rightarrow R_f = (-\infty, -r] \cup [r, +\infty)$

د) $\sqrt{x} + \frac{1}{\sqrt{x}} \sim 0 < \sqrt{x} < \infty \Rightarrow R_f = [r, +\infty)$

الف) $y = x^r + \frac{1}{x^r+r} = x^r + r + \frac{1}{x^r+r} \Rightarrow R_g = [r + \frac{1}{r} + \infty)$

ب) $y = \frac{x^r+a}{\sqrt{x^r+r}} = \sqrt{x^r+r} + \frac{1}{\sqrt{x^r+r}} \Rightarrow R_f = [\frac{a}{r} + \infty)$



الف) $y = |x-r| + |rx+r| \Rightarrow R_f = [r, +\infty)$

ب) $y = |rx-r| - |x+1| \Rightarrow R_f = [r, +\infty)$