

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

$y = \frac{1}{x^3 - 3x} \rightarrow yx^3 - 3xy = 1 \rightarrow y(x^3 - 3x) = 1 \rightarrow x^3 - 3x = \frac{1}{y} \rightarrow (x-1)^3 = \frac{1}{y} + 1$ (ب) ۵

$x-1 = \sqrt[3]{\frac{y+1}{y}} \rightarrow x = \sqrt[3]{\frac{y+1}{y}} + 1$ $\frac{y+1}{y} \geq 0$ $R = (-\infty, -1] \cup (0, +\infty)$

$y = x^3 + 4x^2$ $\begin{cases} x_{max} = \frac{-b}{2a} = -\frac{2}{3} \\ y_{max} = 1\frac{2}{27} \end{cases}$ $R = (-\infty, 1\frac{2}{27}]$ (د)

$y = x^3 - 3x + 1$ $\begin{cases} x_{min} = \frac{-b}{2a} = \frac{1}{2} \\ y_{min} = -\frac{23}{8} \end{cases}$ $R = [-\frac{23}{8}, +\infty)$ (الف) ۱۷۵

$y = \sqrt{4x - x^2}$ $\begin{cases} x_{max} = \frac{-b}{2a} = \frac{2}{-1} = -2 \\ y_{max} = 2 \end{cases}$ $R = \sqrt{(-\infty, 4]} = [0, 2]$ (ج)

$y = \sqrt{x^3 - 3x}$ $\begin{cases} x_{min} = \frac{-b}{2a} = \frac{1}{2} \\ y_{min} = -\sqrt{3} \end{cases}$ $R = [0, +\infty)$ (ج) ۲

$y = x^4 - 4x^3 + 6x^2 + 1$ $R = \mathbb{R}$ (ب)

$y = x^4 - 4x^3 + 6x^2 + 1$ $R = \mathbb{R}$ (الف) ۵

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

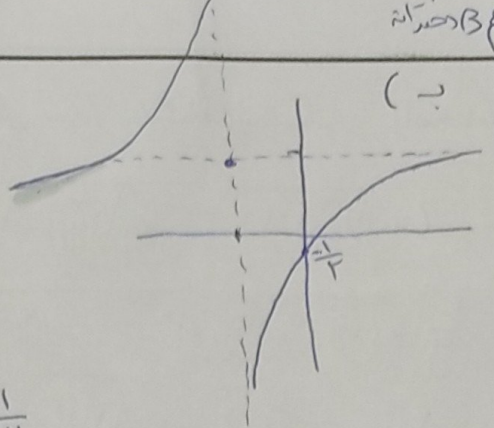
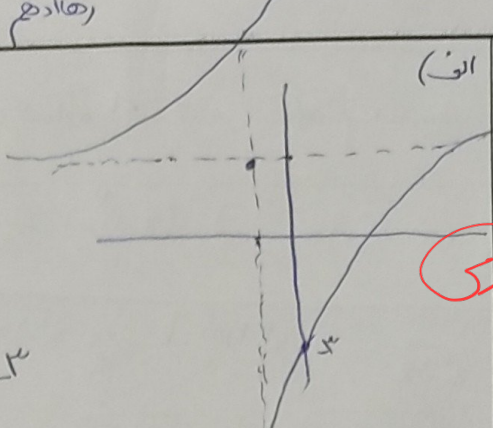
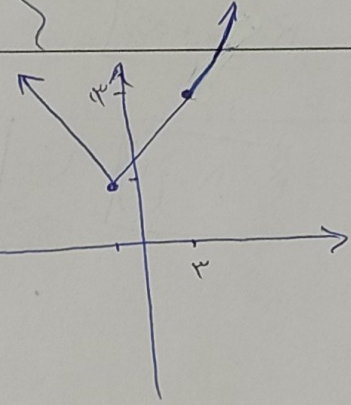
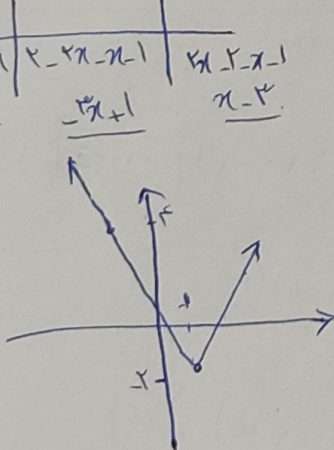
$y = \sqrt{x^4 - 4x^3 + 6x^2 + 1}$ $R = [0, +\infty)$ (ج) ۳

$y = \frac{x+1}{x+1}$ $\frac{a}{c} = 1$ $R = \mathbb{R} - \{-1\}$ (ب)

$y = \frac{x+1}{x-1}$ $\frac{a}{c} = 1$ $R = \mathbb{R} - \{1\}$ (الف) ۴ ۵

$y = \sqrt{\frac{x+1}{x-1}}$ $y^2 = \frac{x+1}{x-1}$ $y^2(x-1) = x+1$ $x = \frac{y^2-1}{y^2+1}$ $y^2 \neq -1$ $R = (0, +\infty)$ $R = (0, +\infty) \cap (0, +\infty) = [0, +\infty)$

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$y = \frac{x-1}{x+2}$ $x = -2$ $y = \frac{a}{c} = 2$ $x=0 \rightarrow y = -\frac{1}{2}$ 	$y = \frac{x-5}{x+1}$ $x = -1$ $y = \frac{a}{c} = 2$ $x=0 \rightarrow y = -5$ 
$\frac{x^4+1}{x^4} = x^4 + \frac{1}{x^4}$ $R = (-\infty, -1] \cup [1, +\infty)$	$R = (-\infty, -1] \cup [1, +\infty)$
$\sqrt{x + \frac{1}{\sqrt{x}}}$ $R = [1, +\infty)$	$\sqrt[3]{x^3+1} = \sqrt[3]{x + \frac{1}{x}}$ $R = (-\infty, -1] \cup [1, +\infty)$
$\frac{x^2+1}{\sqrt{x^2+1}} = \sqrt{x^2+1} + \frac{1}{\sqrt{x^2+1}}$ $x=0 \rightarrow \sqrt{1 + \frac{1}{1}} = 1 + \frac{1}{1} = \frac{2}{1}$ $R = [\frac{2}{1}, +\infty)$	$x + \frac{1}{x^2+1}$ $x=0 \rightarrow 0 + \frac{1}{1} = \frac{1}{1}$ $R = [\frac{1}{1}, +\infty)$ 
$\frac{x^2-x-1}{x^2-x-1} = \frac{x^2-x-1}{x^2-x-1}$ $R = [-1, +\infty)$ 	$\frac{x^2-x-1}{x^2-x-1} = \frac{x^2-x-1}{x^2-x-1}$ $R = [-1, +\infty)$ 