

① $f(-x) - x f(x) = 2|x| + 1$

$f(x) + x f(-x) = 2|-x| + 1$

$f(-x) - x f(x) = f(x) + x f(-x)$

$\hookrightarrow f(-x)(1-x) = f(x)(x+1) \rightarrow f(x) = \frac{f(-x)(1-x)}{x+1}$

② $2f(0) = 4 \rightarrow f(0) = 2$

$f(x^2) + 2 = x^4 - 3x^2 + 4 \rightarrow f(x^2) = x^4 - 3x^2 + 2$

③ $x^2 + x + 2 = yx - y \rightarrow x^2 + (1-y)x + y + 2 = 0$

$\Delta = \frac{y-1 \pm \sqrt{y^2 - 2y + 1 - 4y - 8}}{2} \rightarrow y^2 - 4y - 7 \geq 0$

$y \leq -1 \vee y \geq 7 \leftarrow (y-7)(y+1) \geq 0$

④ الف) $x = \frac{5}{\lambda} \rightarrow 2\left(\frac{25}{\lambda^2}\right) - \frac{25}{\lambda} + 1 = \frac{-14}{\lambda} \rightarrow R_f = \left[-\frac{14}{\lambda}, +\infty\right)$

ب) $x = 3 \rightarrow -9 + 11 - 5 = -3 \rightarrow R_f = [2, +\infty)$

ج) $[0, +\infty) \rightarrow$ چنان زیرادینکل بنویسیم توان
فرده.

$\Rightarrow \mathbb{R}$

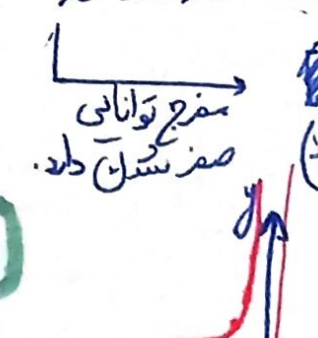
⑤ الف) $\mathbb{R} - \{\frac{3}{2}\}$

ب) $\sqrt{\mathbb{R} - \{4\}} \rightarrow [0, +\infty) - \{2\}$

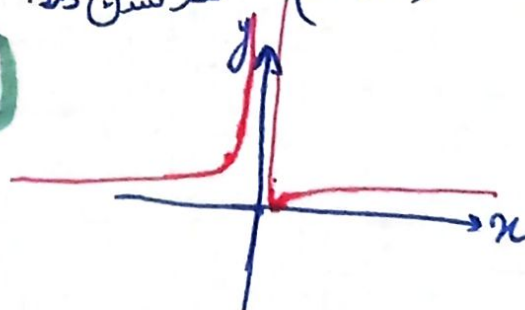
ج) $\sqrt{x^2+3} + \frac{1}{\sqrt{x^2+3}} \rightarrow [\frac{4\sqrt{3}}{3}, +\infty)$

د) $\underbrace{x^2+4 + \frac{1}{x^2+4}}_{\geq \frac{16}{4}} - 4 \rightarrow [\frac{1}{4}, +\infty)$

⑥ $\frac{3x^2+4}{x^2-1} = y \rightarrow x^2 = \frac{y+4}{y-3} = \frac{y+4}{y-3}$
 $\frac{-4}{y-3} + \frac{3}{y-3} \leftarrow x^2 = \frac{y+4}{y-3} \geq 0$
 $y \in (-\infty, -4] \cup (3, +\infty)$

⑦ $x^2 \rightarrow +\infty \rightarrow y = 3$
 $x^2 \rightarrow 0 \rightarrow y = -4$

 $(-\infty, -4] \cup (3, +\infty)$

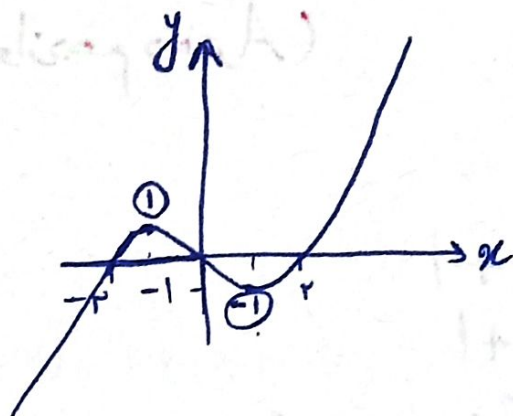
⑧ الف) $[0, +\infty)$



ب) $\sqrt{\frac{9(x-2)}{4(x-2)}} = \boxed{\frac{3}{2}}$

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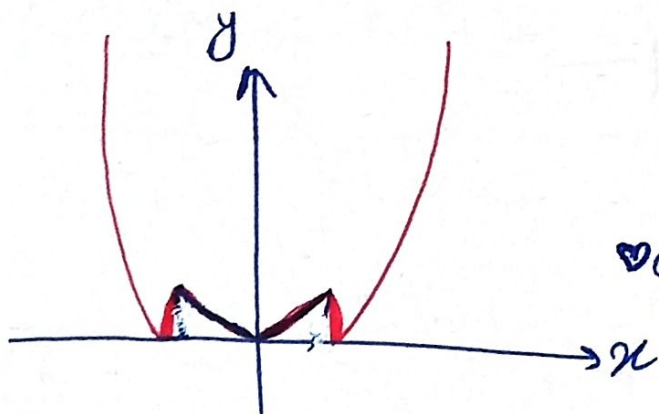
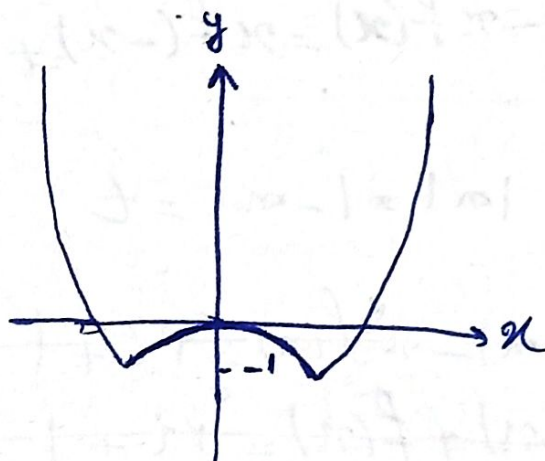
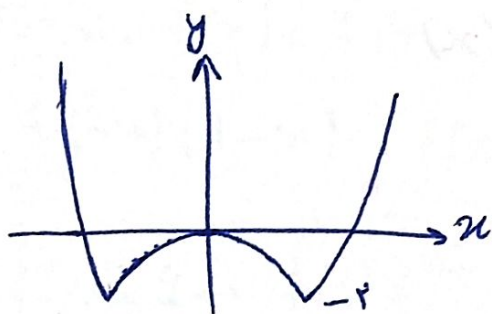
$$R_f = \mathbb{R}$$



$$x^2 - 2x \quad x \geq 0$$

$$-x^2 - 2x \quad x < 0$$

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* یکم کعبه به بزرگی خودت ببخش