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

$\rightarrow R_f = R$

ب) $x^2 y - 2xy - 1 = 0 \rightarrow \Delta \geq 0 \rightarrow 4y^2 + 4y \geq 0 \rightarrow$ (-1, 0: $+ \; - \; +$)

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

۲ الف) $y = \frac{24}{4} - 4 \rightarrow R_f = [4, +\infty)$

ب) $y = \frac{48}{4} = 12 \rightarrow R_f = [12, -\infty)$

ج) $-\frac{28}{4} = -7 \rightarrow R = \sqrt{[-7, +\infty)} \rightarrow R_f = [0, +\infty)$

د) $\frac{36}{4} = 9 \rightarrow R = \sqrt{(-\infty, 9]} \rightarrow R_f = [0, 3]$

۳ الف) $R = R_f$ ب) $R \neq R_f$ ج) $[0, +\infty) = R_f$ د) $[0, +\infty) = R_f$

۴ الف) $R_f = R - \{3\}$

ب) $R_f = R - \{2\}$

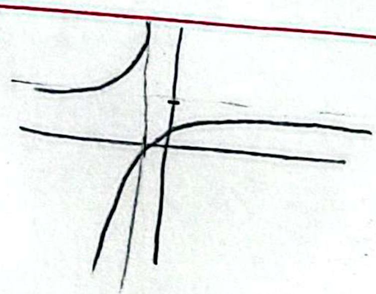
۵ الف) $R_f = [0, +\infty) - \{\sqrt{2}\}$

ب) $[0, +\infty) = R_f$

۶ الف) مجانب قائم $= -1$ = ریشه مخرج

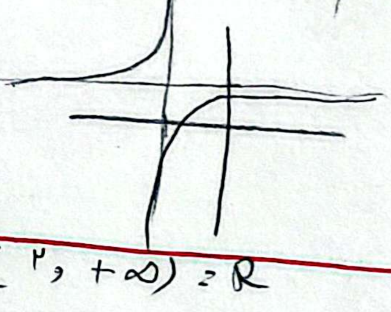
مجانب افقی $= \frac{a}{c} = 2$

فاصله طولی



ب) مجانب قائم $= -2$

مجانب افقی $= 2$



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

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

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

د) $[2, +\infty)$

۸ الف) $x^2 + 3 + \frac{1}{x^2+3} - 3 \xrightarrow{x^2 = 0} \frac{1}{3} \rightarrow R = [\frac{1}{3}, +\infty)$

ب) $y = \frac{x^2 + 5}{\sqrt{x^2+4}} \rightarrow \sqrt{x^2+4} = t \rightarrow y = \frac{t^2+1}{t} = t + \frac{1}{t}$

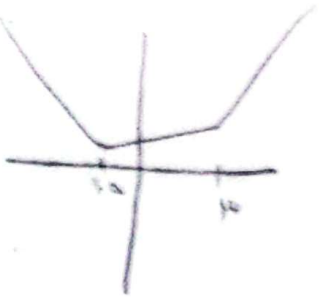
کمترین مقدار صفر $\rightarrow 2 + \frac{1}{2} = \frac{5}{2} \rightarrow R_f = [\frac{5}{2}, +\infty)$

۹-

$x > 3 \longrightarrow f = x + 1$

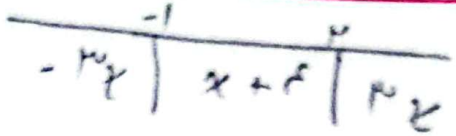
$-\frac{6}{3+1} \leq x \leq 3 \longrightarrow f = 2x + 7$

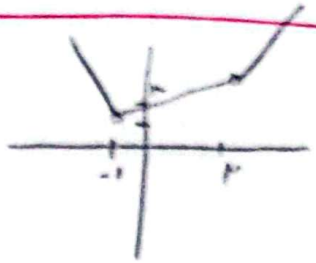
$x < -\frac{6}{3+1} \longrightarrow f = -x - 1$



جمع‌بندی

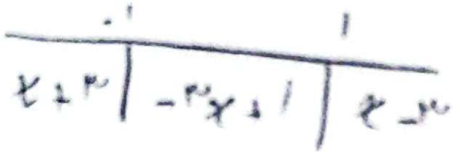
۱۰ الف)





$R_f = [3, +\infty)$

ب)



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