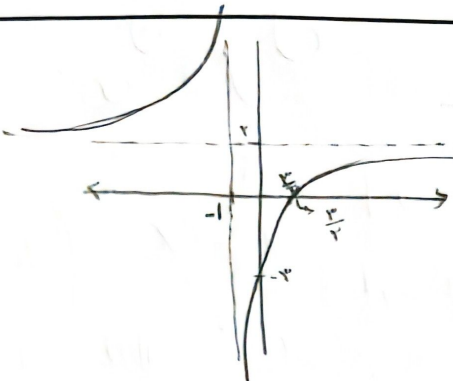
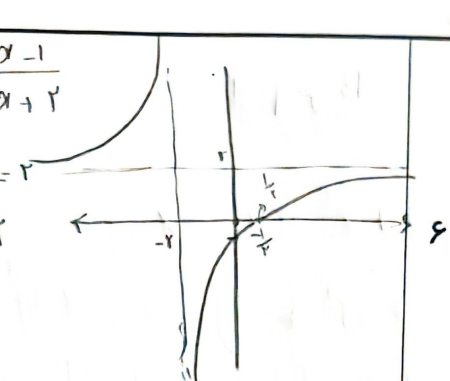
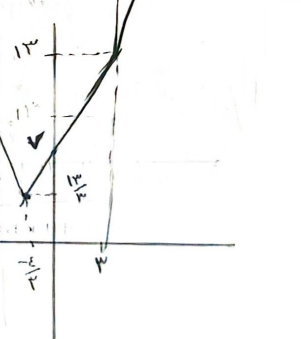


الف) $x^3 - 3x^2 + 3x = y$ $(x-1)^3 + 1 = y \Rightarrow (x-1)^3 = y-1$ $x-1 = \sqrt[3]{y-1} \Rightarrow x = \sqrt[3]{y-1} + 1$ $R_f = R$	ب) $y = \frac{1}{x^2 - 2x}$ $yx^2 - 2yx - 1 = 0$ $\Delta = b^2 - 4ac \Rightarrow (-2y)^2 - 4(y)(-1) = 4y^2 + 4y = 4y(y+1)$ $y = 0 \Rightarrow$ رخ $R_f = (-\infty, -1) \cup (0, +\infty)$		
الف) $x^2 - 4x + 1$ $x_{\min} = \frac{4}{2} = 2$ $y_{\min} = 6$ $R_f = [6, +\infty)$	ب) $-x^2 + 4x + 3$ $x_{\max} = 3$ $y_{\max} = 11$ $R_f = (-\infty, 11]$	ج) $\sqrt{x^2 - 4x - 3}$ $x_{\min} = 2$ $y_{\min} = -7$ $R_f = [-7, +\infty)$ $\sqrt{[-7, +\infty)} = [0, +\infty)$	د) $\sqrt{-x^2 + 4x}$ $x_{\max} = 3$ $y_{\max} = 9$ $R_f = (-\infty, 9]$ $\sqrt{(-\infty, 9]} = [0, 3]$
الف) $x^3 - 5x^2 + 2x + 1$ $R_f = R$	ب) $y = x^3 - 4x^2 + 3x + 2$ $D_f = R$	ج) $\sqrt{x^3 - 4x^2 + 5x + 1}$ $R_f = \sqrt{R} = [0, +\infty)$	د) $y = (x^3 - 4x^2 + 3x + 1)^2$ $R_f = (R)^2 = [0, +\infty)$
الف) $y = \frac{3x+1}{x-2} \Rightarrow R_f = R - \{3\}$ $R_f = R - \{9\}$	ب) $y = \frac{2x+1}{x+1}$ $R_f = R - \{1\}$		
الف) $y = \sqrt{\frac{4x+4}{x+1}} \rightarrow R_f = R - \{1\}$ $\sqrt{R - \{1\}} \Rightarrow [0, \sqrt{2}) \cup (\sqrt{2}, +\infty)$	ب) $y = \sqrt{\frac{3x+1}{2-x}} \rightarrow R_f = R - \{-3\}$ $\sqrt{R - \{-3\}} \Rightarrow [0, +\infty)$		

الف) $y = \frac{x-3}{x+1}$ نقطه افقی: $y=2$ نقطه عمودی: $x=-1$ 	ب) $y = \frac{x-1}{x+2}$ نقطه افقی: $y=2$ نقطه عمودی: $x=-2$ 													
الف) $y = \sin x \cdot \frac{1}{\sin x}$ $R_f = (-\infty, -\pi] \cup [\pi, +\infty)$	ز) $y = \frac{\sqrt[3]{x^2+1}}{\sqrt[3]{x}}$ $R_f = (-\infty, -\pi] \cup [\pi, +\infty)$	ح) $y = \sqrt{x} + \frac{1}{\sqrt{x}}$ $R_f = [\pi, +\infty)$												
الف) $y = x^2 + \frac{1}{x^2+3}$ $x^2_{\min} = 0 \rightarrow R_f = [\frac{1}{3}, +\infty)$	ب) $y = \frac{x^2+\delta}{\sqrt{x^2+\varepsilon}} = \frac{x^2+\varepsilon+1}{\sqrt{x^2+\varepsilon}} = \sqrt{x^2+\varepsilon} + \frac{1}{\sqrt{x^2+\varepsilon}}$ $\min \sqrt{x^2+\varepsilon} + \frac{1}{\sqrt{x^2+\varepsilon}} = \sqrt{0+\varepsilon} + \frac{1}{\sqrt{0+\varepsilon}} = \frac{\delta}{\varepsilon}$ $R = [\frac{\delta}{\varepsilon}, +\infty)$													
$y = x-3 + 3x+1$ نقطه: $-\frac{\varepsilon}{3}$ 3 <table border="1"> <tr> <td>$3-x-\varepsilon-3x$</td> <td>$3-x+3x+\varepsilon$</td> <td>$x-3+3x+\varepsilon$</td> </tr> <tr> <td>$(-4x-1)$</td> <td>$(2x+\varepsilon)$</td> <td>$(4x+1)$</td> </tr> </table> if $\begin{cases} x \geq 3 \rightarrow 4x+1 \\ -\frac{\varepsilon}{3} \leq x < 3 \rightarrow 2x+\varepsilon \\ x < -\frac{\varepsilon}{3} \rightarrow -4x-1 \end{cases}$	$3-x-\varepsilon-3x$	$3-x+3x+\varepsilon$	$x-3+3x+\varepsilon$	$(-4x-1)$	$(2x+\varepsilon)$	$(4x+1)$								
$3-x-\varepsilon-3x$	$3-x+3x+\varepsilon$	$x-3+3x+\varepsilon$												
$(-4x-1)$	$(2x+\varepsilon)$	$(4x+1)$												
الف) $y = x-1 + 2x+1$ نقطه: -1 1 <table border="1"> <tr> <td>$x-x-1-2x$</td> <td>$x-x+2x+1$</td> <td>$x-1+2x+1$</td> </tr> <tr> <td>$(-3x)$</td> <td>$(x+1)$</td> <td>$(3x)$</td> </tr> </table> if $\begin{cases} x \geq 1 \rightarrow 3x \\ -1 \leq x < 1 \rightarrow x+1 \\ x < -1 \rightarrow -3x \end{cases}$ $R_f = [1, +\infty)$	$x-x-1-2x$	$x-x+2x+1$	$x-1+2x+1$	$(-3x)$	$(x+1)$	$(3x)$	ب) $y = x-1 - x+1$ نقطه: -1 1 <table border="1"> <tr> <td>$x-x+1-1$</td> <td>$x-x-2-1$</td> <td>$x-1-1-x$</td> </tr> <tr> <td>(0)</td> <td>(-2)</td> <td>(-2)</td> </tr> </table> if $\begin{cases} x \geq 1 \rightarrow x-1 \\ -1 \leq x < 1 \rightarrow -2 \\ x < -1 \rightarrow -x-1 \end{cases}$ $R_f = [-1, +\infty)$		$x-x+1-1$	$x-x-2-1$	$x-1-1-x$	(0)	(-2)	(-2)
$x-x-1-2x$	$x-x+2x+1$	$x-1+2x+1$												
$(-3x)$	$(x+1)$	$(3x)$												
$x-x+1-1$	$x-x-2-1$	$x-1-1-x$												
(0)	(-2)	(-2)												