

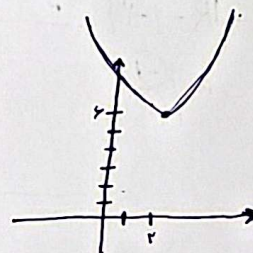
الف) $x^3 - 3x^2 + 3x - 1 = (x-1)^3 + 1 \rightarrow y-1 = (x-1)^3$

$\xrightarrow{\sqrt[3]{}} \sqrt[3]{y-1} + 1 = x \xrightarrow{\text{دومین نسبت}} R_f = \mathbb{R}$

ب) $y = \frac{1}{x^2 - 2x} \rightarrow yx^2 - 2yx - 1 = 0 \xrightarrow{\Delta} x = \frac{2y \pm \sqrt{\Delta}}{2y}$

$\rightarrow \Delta \geq 0 \sim 4y^2 + 4y \geq 0 \rightarrow 4y(y+1) \geq 0$
 $\downarrow \quad \downarrow$
 $0 \quad -1$

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



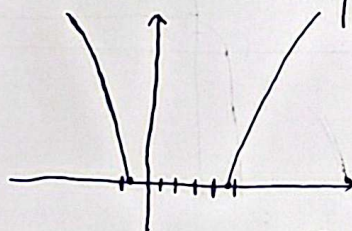
الف) $y = x^2 - 4x + 6 \rightarrow \text{ext} \left| \begin{array}{l} \frac{b}{2a} \rightarrow (2) \\ \frac{\Delta}{4a} \rightarrow (4) \end{array} \right.$

ب) $y = -x^2 + 2x + 3 \rightarrow \text{ext} \left| \begin{array}{l} (3) \\ (12) \end{array} \right.$
 $-(x^2 - 2x - 3)$

$R_f = [2, +\infty)$

$R_f = (-\infty, 12]$

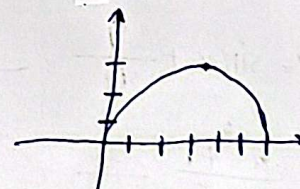
ج) $y = \sqrt{x^2 - 5x - 3} \rightarrow \text{ext} \left| \begin{array}{l} (2) \\ (-7) \end{array} \right.$



$[-7, +\infty) \xrightarrow{\sqrt{}} R_f = [0, +\infty)$

د) $y = \sqrt{4x - x^2} \rightarrow \text{ext} \left| \begin{array}{l} (3) \\ (1) \end{array} \right.$

$(-\infty, 9] \xrightarrow{\sqrt{}} R_f = [0, 3]$



الف) $y = x^2 - 5x^2 + 2x + 1 \rightarrow R_f = \mathbb{R}$

ب) $y = x^5 - 2x^4 + 3x + 2 \rightarrow R_f = \mathbb{R}$

ج) $y = \sqrt{x^5 - 2x^4 + 3x + 1} \rightarrow \mathbb{R} \xrightarrow{\sqrt{}} R_f = [0, +\infty)$

د) $y = (x^5 - 5x^4 + 3x + 1)^2 \rightarrow \mathbb{R} \xrightarrow{\sqrt{}} R_f = [0, +\infty)$

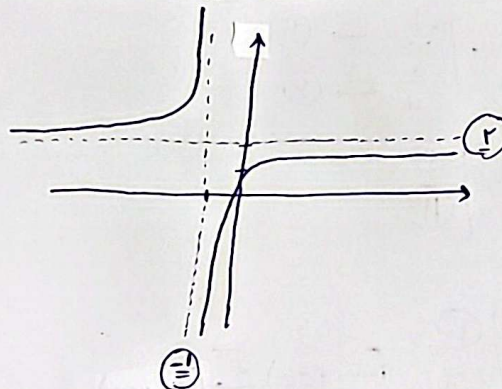
الف) $y = \frac{x^3 + 1}{x - 2}$ $\xrightarrow{IR - \{\frac{1}{2}\}}$ $R_f = IR - \{2\}$ (۴)

ب) $y = \frac{x^2 + 1}{x + 1}$ $\xrightarrow{IR - \{\frac{1}{2}\}}$ $R_f = IR - \{2\}$

الف) $y = \sqrt{\frac{x^2 + 4}{x + 1}}$ $\rightarrow IR - \{2\} \xrightarrow{\sqrt{\quad}} [0, +\infty) - \{\sqrt{2}\} = R_f$ (۵)

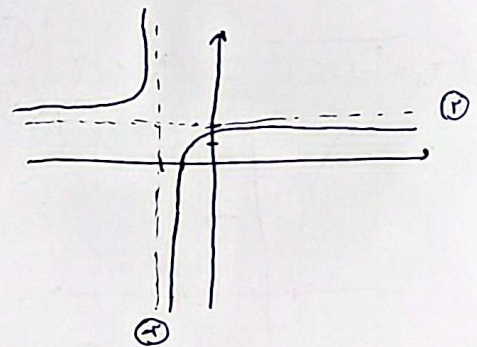
ب) $y = \sqrt{\frac{x^2 + 1}{x - 2}}$ $\rightarrow IR - \{-2\} \xrightarrow{\sqrt{\quad}} [0, +\infty) = R_f$

الف) $y = \frac{x^2 - 3}{x + 1}$ جانب $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$



قائم
عانب ۲ = ریشه خارج
عانب انی = $\left\{ \frac{d}{dx} \right\}$ (۶)

ب) $y = \frac{x^2 - 1}{x + 2}$ جانب $\begin{pmatrix} -2 \\ 2 \end{pmatrix}$



الف) $y = \sin x + \frac{1}{\sin x}$ $\rightarrow R_f = (-\infty, -2] \cup [2, +\infty)$ (۷)

ب) $y = \frac{x^4 + 1}{x^3}$ $\xrightarrow{\text{تکلیک}}$ $x + \frac{1}{x^3}$ $\rightarrow R_f = (-\infty, -2] \cup [2, +\infty)$

ج) $y = \frac{\sqrt{x^2} + 1}{\sqrt{x}}$ $\xrightarrow{\text{تکلیک}}$ $\sqrt{x} + \frac{1}{\sqrt{x}}$ $\rightarrow R_f = (-\infty, -2] \cup [2, +\infty)$

د) $y = \sqrt{x} + \frac{1}{\sqrt{x}}$ $\rightarrow R_f = [2, +\infty)$

الف) $y = x^2 + \frac{1}{x^2+3} \xrightarrow{+3, -3} (x^2+3) + \frac{1}{(x^2+3)} - 3 \rightarrow [\frac{10}{3}-3, +\infty)$ (1)

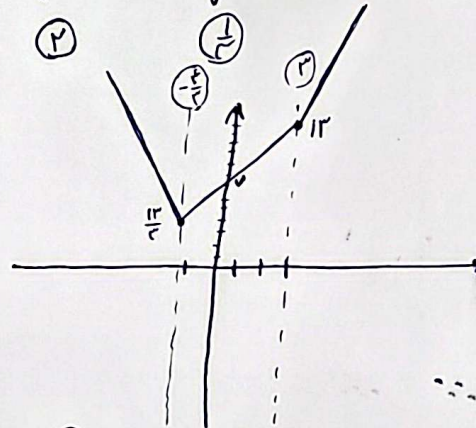
$\rightarrow R_f = [\frac{1}{3}, +\infty)$

ب) $y = \frac{x^2+5}{\sqrt{x^2+5}} = \frac{(x^2+5)+1}{\sqrt{x^2+5}} \rightarrow \sqrt{x^2+5} + \frac{1}{\sqrt{x^2+5}} \rightarrow R_f = [2/5, +\infty)$

$y = |x-2| + |3x+5|$

Number line analysis:

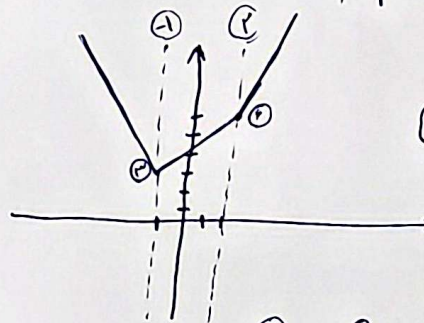
- Points: $-\frac{5}{3}$ and 2
- Regions:
 - $x < -\frac{5}{3}$: $-x-2-3x-5 = -4x-7$
 - $-\frac{5}{3} < x < 2$: $-x-2+3x+5 = 2x+3$
 - $x > 2$: $x-2+3x+5 = 4x+3$



الف) $y = |x-2| + |2x+2|$

Number line analysis:

- Points: -1 and 2
- Regions:
 - $x < -1$: $-x+2-2x-2 = -3x$
 - $-1 < x < 2$: $-x+2+2x+2 = x+4$
 - $x > 2$: $x-2+2x+2 = 3x$

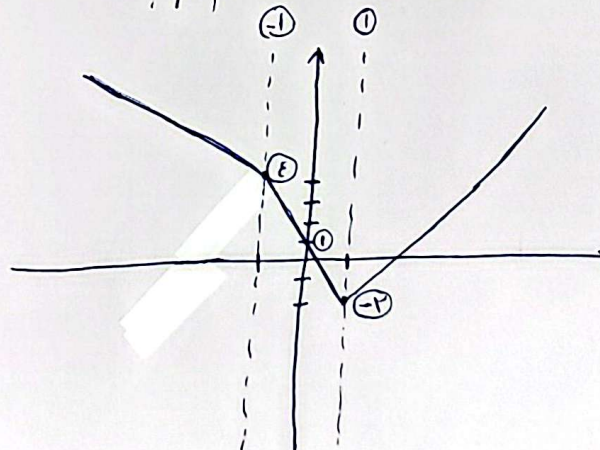


$R_f = [2, +\infty)$

ب) $y = |2x-2| - |x+1|$

Number line analysis:

- Points: -1 and 1
- Regions:
 - $x < -1$: $-2x+2-(-x-1) = -x+3$
 - $-1 < x < 1$: $-2x+2-(-x+1) = -x+1$
 - $x > 1$: $2x-2-(-x-1) = 3x-1$



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