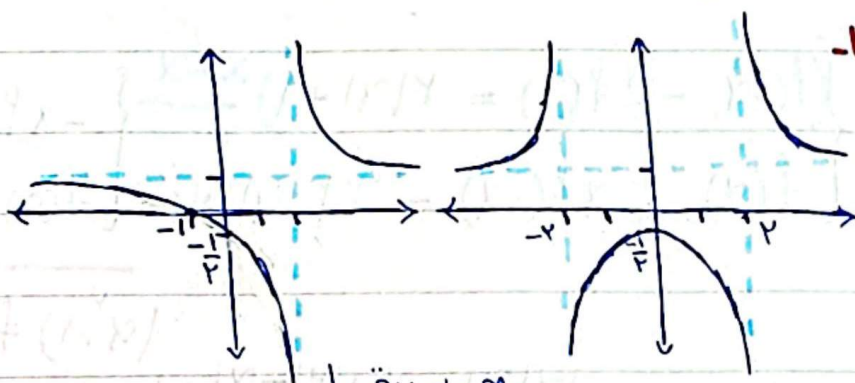


توانه طالعريان - دوازم (ضرب) - تلف به

(الف) $y = \frac{|x|+1}{|x|-2}$

مجاانب افق: $y=1$

مجاانب قائم: $x=2$



$R_f = \mathbb{R} - (-\frac{1}{2}, 1]$

لاکهای منفی را
برای y کنیم
و باقی مانده ی
موجود را قرینه می کنیم
 $y = \frac{x+1}{x-2} \rightarrow y = \frac{|x|+1}{|x|-2}$

(ب) $y = \frac{x^2+1}{|x|} = |x| + \frac{1}{|x|} \xrightarrow{|x| > 0} R_f = [2, +\infty)$

(برای هر عدد حقیقی داریم: اگر $a > 0 \Leftarrow a + \frac{1}{a} \geq 2$)

$y = \frac{x^2+2x-2}{x+3} \Rightarrow yx + 3y = x^2 + 2x - 2$
 $\Rightarrow x^2 + (2-y)x - 3y - 2 = 0$

$x = \frac{y-2 \pm \sqrt{(y-2)^2 + 4(3y+2)}}{2} \Rightarrow (y-2)^2 + 4(3y+2) \geq 0$

$\Rightarrow y^2 - 4y + 4 + 12y + 8 \geq 0 \Rightarrow y^2 + 8y + 12 \geq 0$

$(y+2)(y+4) \geq 0$
 $\begin{matrix} -4 & -2 \\ + & | & - & | & + \end{matrix}$
 $R_f = (-\infty, -4] \cup [-2, +\infty)$

$y = \frac{x^2-x+\frac{1}{k}}{x^2-x+1} \leadsto x^2-x+1 \neq 0$

$\Delta = b^2 - 4ac = 1 - 4 = -3 < 0, a > 0$

$D_f = \mathbb{R}$
 $\Leftarrow x^2 - x + 1$ همیشه مثبت است $\Leftarrow$

$\hookrightarrow yx^2 - yx + y = x^2 - x + \frac{1}{k} \Rightarrow (y-1)x^2 + (1-y)x + y - \frac{1}{k} = 0$

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$$\Rightarrow x = \frac{y-1 \pm \sqrt{(y-1)^2 - 4(y-1)(y-\frac{1}{4})}}{2(y-1)} \sim y \neq 1 \quad (1)$$

$$\Rightarrow (y-1)^2 - (y-1)(4y-1) \geq 0 \Rightarrow (y-1)(y-1-4y+1) \geq 0$$

$$\Rightarrow -3y(y-1) \geq 0 \quad \begin{array}{c} 0 \quad 1 \\ - \quad | \quad + \quad | \quad - \end{array} \quad (2)$$

(1), (2) $\Rightarrow R_f = [0, 1)$

الف) $y = \sqrt{-x^2 + 4x - 1} \sim \max \left| \begin{array}{l} \frac{-b}{2a} = \frac{-4}{-2} = 2 \\ -4 + 1 - 1 = -4 \end{array} \right. \quad -4$

$$y = \sqrt{(-\infty, 4]} \Rightarrow R_f = [0, \sqrt{4}]$$

ب) $y = \sqrt[3]{4x^2 - 14x} \sim \min \left| \begin{array}{l} \frac{-b}{2a} = \frac{14}{8} = \frac{7}{4} \\ 4x^2 - 14x = -1 \end{array} \right.$

$$y = \sqrt[3]{[-1, +\infty)} \Rightarrow R_f = [-2, +\infty)$$

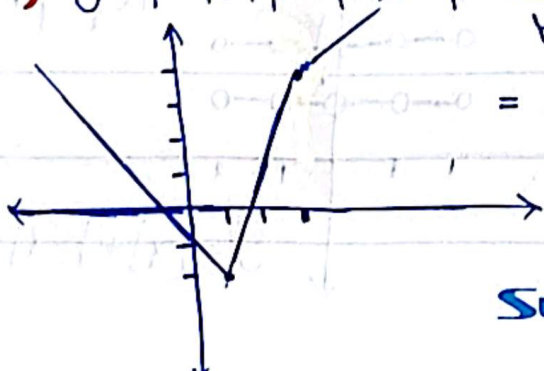
الف) $y = \log(x^2 - x + 14) \sim y = \log(-\infty, +\infty) \quad -5$

$$\log_1^0 = -\infty, \log_1^{+\infty} = +\infty \Rightarrow R_f = (-\infty, +\infty) = \mathbb{R}$$

ب) $y = \log_2 \left(\frac{x^2+1}{x} \right) \rightarrow \frac{x^2+1}{x} \geq 0 \Rightarrow x > 0$
(صورت هموار مثبت است)

$$\Rightarrow x + \frac{1}{x} \geq 2 \quad y = \log_2 [2, +\infty) \Rightarrow R_f = [1, +\infty)$$

الف) $y = |2x-2| - |x-3| \quad -4$

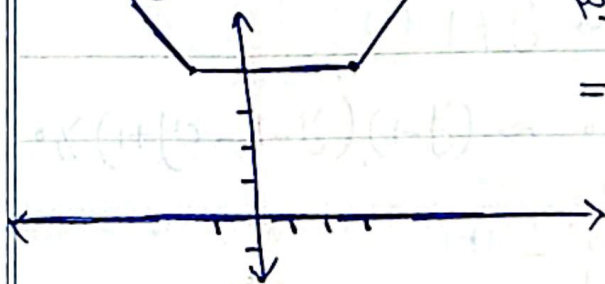


$$\begin{array}{ccc} 1 & 3 & \\ \hline 2-2x+3-x & 2x-2+x & 2x-2-x+3 \\ = -x+1 & = x-2 & = x+1 \end{array}$$

$$R_f = [-1, +\infty)$$

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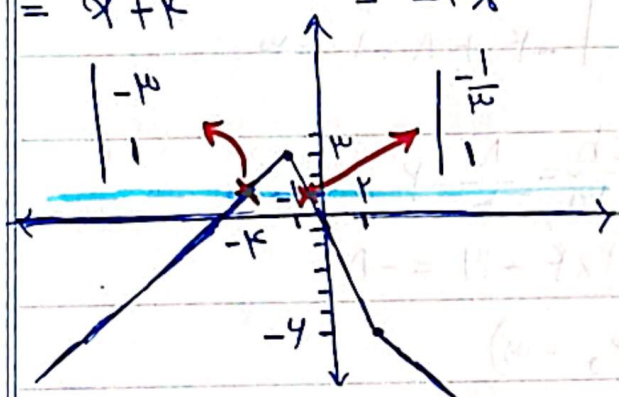
ب) $y = |x-3| + |x+1|$



$$\begin{array}{ccc} & -1 & 3 \\ 3-x-x-1 & 3-x+x+1 & x-3+x+1 \\ = -2x+2 & = 4 & = 2x-2 \end{array}$$

$$R_f = [4, +\infty)$$

$$\begin{array}{ccc} & -1 & 2 \\ 2-x+2x+2 & 2-x-2x-2 & x-2-2x-2 \\ = x+4 & = -3x & = -x-4 \end{array}$$



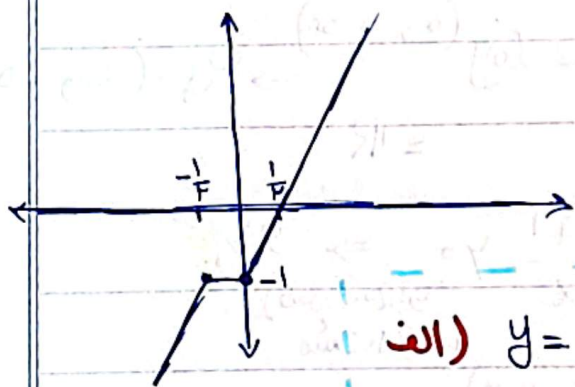
مثلاً $y = |x-2| - |3x+2|$ باید زیر خط

$y=1$ قرار بگیرد

$$R_f = \mathbb{R} - (-3, \frac{1}{3})$$

یا به آن برخورد کند

د) $y = 3x - |2x+1| + |x|$

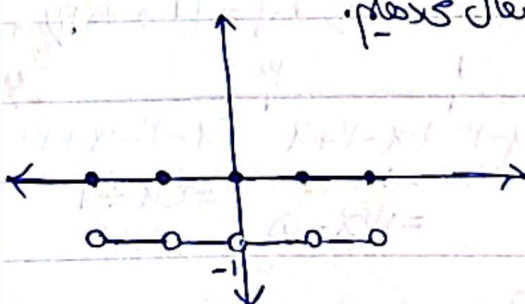


$$\begin{array}{ccc} & -\frac{1}{2} & 0 \\ 3x+2x+1 & 3x-2x-1 & 3x-2x-1+x \\ -x & -x & = 2x-1 \\ = 4x+1 & = -1 & \end{array}$$

$$R_f = \mathbb{R}$$

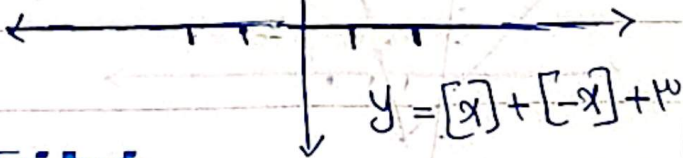
ه) $y = [x] + [3-x] = [x] + [-x] + 3$

مثلاً $y = [x] + [-x]$ را سه واحد به سمت بالا انتقال دهیم.



$$y = [x] + [-x]$$

$$R_f = \{2, 3\}$$



$$y = [x] + [-x] + 3$$

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سأفرض أنني عرض ابن نفعاً في حصة

ب) $y = 3x - [x]$

$-2 < x < -1 \Rightarrow [x] = -2 \Rightarrow y = 3x + 2$

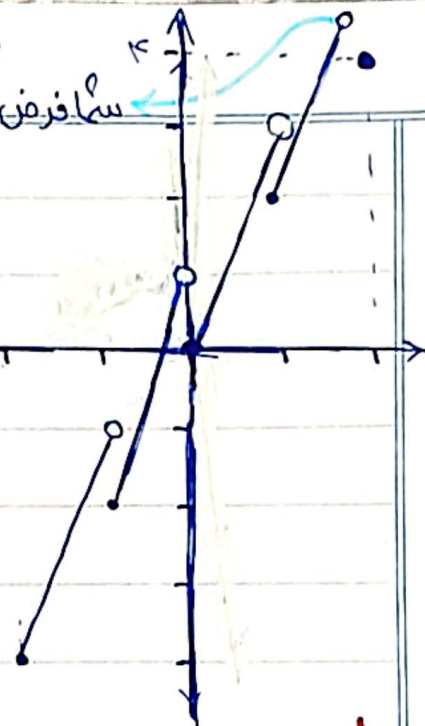
$-1 < x < 0 \Rightarrow [x] = -1 \Rightarrow y = 3x + 1$

$0 < x < 1 \Rightarrow [x] = 0 \Rightarrow y = 3x$

$1 < x < 2 \Rightarrow [x] = 1 \Rightarrow y = 3x - 1$

$x = 2 \Rightarrow y = 5$

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



الف) $y = \sin^2 x - \sin x + 1$

$\frac{-b}{2a} = \frac{1}{2}$

$\Rightarrow R_f = [\frac{3}{4}, 1]$

$\sin x = 1 \rightarrow 1 - 1 + 1 = 1$
 $\sin x = -1 \rightarrow 1 + 1 + 1 = 3$
 $\sin x = \frac{1}{2} \rightarrow \frac{1}{4} - \frac{1}{2} + 1 = \frac{3}{4}$

ب) $y = \sin^2 x + \sin^2 x + 1$

$\frac{-b}{2a} = \frac{-1}{2}$

$\Rightarrow R_f = [1, 3]$

$\sin^2 x = 0 \rightarrow 0 + 0 + 1 = 1$
 $\sin^2 x = 1 \rightarrow 1 + 1 + 1 = 3$
 $\sin^2 x = -\frac{1}{2} \rightarrow X$