

$$\frac{1}{x-1} > |x-1| \xrightarrow{\text{if } x > 1} \frac{1}{x-1} < x-1 \rightarrow x^2 - 2x + 1 < x-1 \rightarrow x^2 - 3x + 2 < 0$$

$$\xrightarrow{\text{if } x < 1} \frac{1}{x-1} < -x+1 \rightarrow |2-x+1| \quad (2)$$

$$x^2 - 3x + 2 > 0 \rightarrow x < 0 \quad \text{ریشه ندارد} \quad \checkmark$$

$$\frac{|2x-1|}{x} > 2 \rightarrow -2 < \frac{2x-1}{x} < 2$$

$$-2 < 2 - \frac{1}{x} < 2$$

$$-4 < -\frac{1}{x} < 0 \rightarrow \frac{1}{x} > 0 \rightarrow x > 0 \quad \checkmark$$

$$2 - \frac{1}{x} < 2 \rightarrow -\frac{1}{x} < 0$$

$$\frac{|x-2|}{2x+1} > 1 \rightarrow \frac{x-2}{2x+1} > 1 \quad \frac{x-2}{2x+1} < -1$$

$$x > -2, \quad x < \frac{1}{3}$$

$$\frac{x+\frac{1}{r}-\frac{d}{r}}{r(x+\frac{1}{r})} > \frac{1}{r} \rightarrow \frac{x-\frac{d}{r}}{r(x+\frac{1}{r})} > \frac{1}{r} \rightarrow x > \frac{d}{r}$$

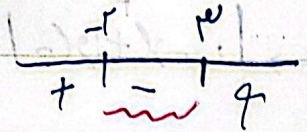
$$\left| \frac{n-2}{n+1} \right| > 1 \quad n \neq -\frac{1}{2}$$

$$|n-2| > |n+1| \quad \text{row} \quad n^2 - 2n + 4 > n^2 + 2n + 1$$

$$-4n + 3 < 0 \rightarrow \frac{-3}{4} < n < \frac{3}{4}$$

$$x^2 \leq |x+4| \rightarrow x^2 \leq x+4 \rightarrow \textcircled{2} - 14$$

$$x^2 - x - 4 \leq 0 \rightarrow (x-2)(x+2) \leq 0$$



$$-2 \leq x \leq 2 \quad \text{I}$$

$$x^2 - x - 4 \rightarrow x^2 + x + 4 > 0 \quad \text{II}$$

$$\text{discriminant} = 1 - 16 = -15 < 0 \quad \text{II}$$

$$\text{II} \rightarrow x^2 + x + 4 > 0 \rightarrow$$

$$|x - \alpha| < \beta \rightarrow -\beta + \alpha < x < \beta + \alpha$$

$$\begin{cases} \beta + \alpha = 2 \\ -\beta + \alpha = -2 \end{cases} \rightarrow$$

$$\boxed{x^2 \leq 1} \rightarrow x \in \left[-\frac{1}{2}, \frac{1}{2}\right] \checkmark$$

$$f_2(x) = |x+1| - |x| + |x-2| \rightarrow \textcircled{2} - 16$$

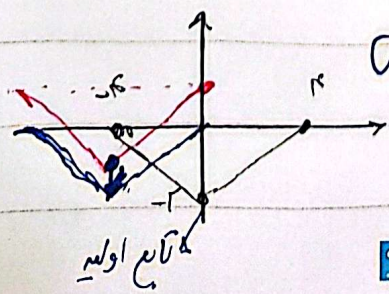
$$\text{if } x \geq 2 \rightarrow x+1 - x + x-2 = x-1 = 0$$

$$\text{if } 1 \leq x < 2 \rightarrow x+1 - x - x+2 = -x+3 = 0 \rightarrow x=3$$

$$\text{if } 0 \leq x < 1 \rightarrow x+1 + x - x+2 = x+3 = 0 \rightarrow x=-3$$

$$-1 > x \rightarrow -x-1 + x - x+2 = -x+1 = 0 \rightarrow x=1$$

$$\max y = 3, \min y = -1 \rightarrow \max y + \min y = 2 \checkmark$$



$$f_2(x) = \left| \frac{1}{2}x+2 \right| - 1 = \text{distance from } -1 \text{ to } \frac{1}{2}x+2$$

$$\left| \frac{1}{2}x+2 \right| - 1 \geq \left| \frac{1}{2}x \right| - 1 \quad \textcircled{2}$$

$$\left| \frac{1}{2}x+2 \right| \geq \left| \frac{1}{2}x \right| - 1$$

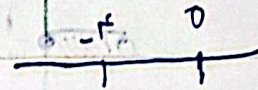
Subo
DATE

اداره درصفت بعدی

$$\left| \frac{1}{x+2} \right| - \left| \frac{1}{x} \right| \geq -1$$

$$\text{if } x \geq 0 \rightarrow \frac{1}{x+2} - \frac{1}{x} \geq -1$$

اما باید است آوردن اینها را به دست بیاید. ضابطه زیری می کنیم



$$\frac{1}{x+2} - \frac{1}{x} \geq -1 \quad \times \text{سود}$$

$$\text{if } x < -2 \rightarrow \frac{1}{x+2} + \frac{1}{x} \geq -1 \rightarrow \frac{1}{x+2} \geq -1 - \frac{1}{x} \rightarrow \frac{1}{x+2} \geq -\frac{x+1}{x} \rightarrow \frac{1}{x+2} \geq -\frac{x+1}{x}$$

if $x < -2$

$$\text{if } -2 < x < 0 \rightarrow \frac{1}{x+2} - \frac{1}{x} \geq -1 \rightarrow \frac{1}{x+2} \geq -1 + \frac{1}{x} \rightarrow \frac{1}{x+2} \geq \frac{-x+1}{x}$$

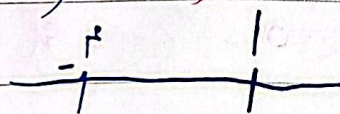
$$\left| \frac{1}{x+2} \right| - \left| \frac{1}{x} \right| \geq -1 \quad \text{و} \quad \left| \frac{1}{x} \right| - \left| \frac{1}{x+2} \right| \geq -1$$

بنابراین دو نمودار باطل می شود. متقاطع هستند

$$\left(-2, -\frac{1}{2} \right)$$

$$f(x) = \left[\left| \frac{1}{x+2} \right| - \left| \frac{1}{x} \right| \right] \quad \text{انف}$$

مجدداً ضابطه زیری می کنیم



$$\text{I if } x > -1 \rightarrow \frac{1}{x+2} - \frac{1}{x} \geq -1 \rightarrow \frac{1}{x+2} \geq -1 + \frac{1}{x} \rightarrow \frac{1}{x+2} \geq \frac{-x+1}{x}$$

$$\text{II if } x > -1 \rightarrow \frac{1}{x+2} - \frac{1}{x} \geq -1 \rightarrow \frac{1}{x+2} \geq -1 + \frac{1}{x} \rightarrow \frac{1}{x+2} \geq \frac{-x+1}{x}$$

$$\text{III if } x > -1 \rightarrow \frac{1}{x+2} - \frac{1}{x} \geq -1 \rightarrow \frac{1}{x+2} \geq -1 + \frac{1}{x} \rightarrow \frac{1}{x+2} \geq \frac{-x+1}{x}$$

حال به جای x در II، باید است آوردن داخل [قرار دهیم

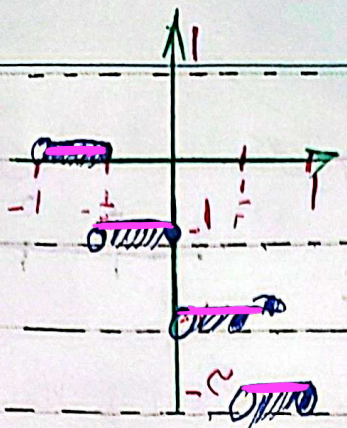
$$\frac{1}{x+2} - \frac{1}{x} \geq -1 \rightarrow \frac{1}{x+2} \geq -1 + \frac{1}{x} \rightarrow \frac{1}{x+2} \geq \frac{-x+1}{x} \rightarrow \frac{1}{x+2} \geq \frac{-x+1}{x}$$

$$R_f = \{ -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5 \}$$

$$f(x) = \frac{1}{x} - \left[\frac{x+1}{x} \right] \rightarrow \frac{1}{x} - \left[1 + \frac{1}{x} \right] = \frac{1}{x} - \left[\frac{x+1}{x} \right] - 1 \rightarrow$$

$$\left| \frac{1}{x} - \left[\frac{x+1}{x} \right] \right| \geq -1 \rightarrow \left| \frac{1}{x} - \left[\frac{x+1}{x} \right] \right| \geq -1 \quad R_f = [-1, 0] \quad \checkmark$$

الف)



$$y = \begin{cases} -2x & x \in (-1, 0) \end{cases} \quad (2)$$

رنگ کردن

منحرفه فقط

به خط

$$-1 < x < -\frac{1}{2} \Rightarrow 0$$

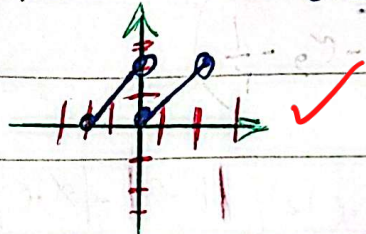
$$\begin{cases} -\frac{1}{2} < x < 0 \Rightarrow -1 \\ 0 < x < \frac{1}{2} \Rightarrow -2 \\ \frac{1}{2} < x < 1 \Rightarrow -0 \end{cases}$$

ب) $y = \begin{cases} x & x \in (-1, 1) \end{cases}$

$$-2x < x < -1 \Rightarrow -1 < x < -1 \Rightarrow -1 < x < 0$$

$$x < -1 \Rightarrow -1 < x < 0$$

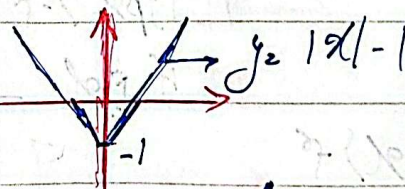
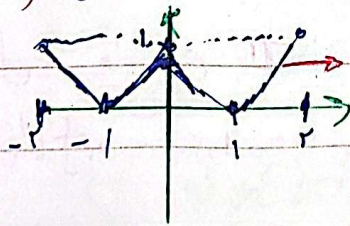
$$x < -1 \Rightarrow \begin{bmatrix} x \\ 1 \end{bmatrix} \Rightarrow f(x) = x + 1$$



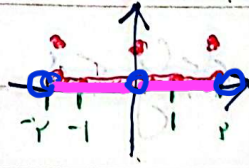
$-1 < x < 0 \Rightarrow f(x) = x$

$0 < x < 1 \Rightarrow \begin{bmatrix} x \\ 0 \end{bmatrix} \Rightarrow f(x) = x$

الف) $y = \begin{cases} |x| - 1 & x \in [-1, 1] \end{cases}$



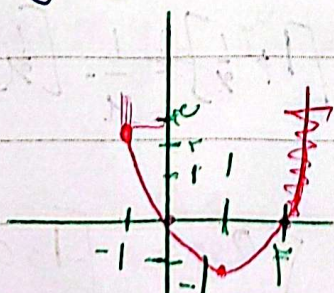
(2) - 1



ب) $y = \begin{cases} x - 2x & x \in [-1, 1] \end{cases}$

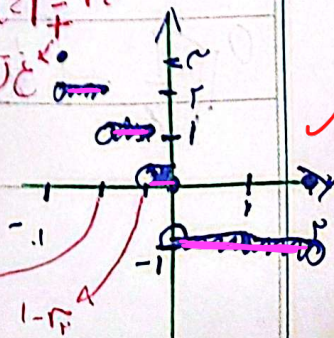
ابتدا سه دایره مشخص برآید و رنگ کنیم

$$\begin{cases} \frac{1}{2} < x < 1 \\ -\frac{1}{2} < x < \frac{1}{2} \\ -1 < x < -\frac{1}{2} \end{cases}$$



$$y = x - 2x = -x \Rightarrow y = -x$$

$$y = |x| - 1$$



9- (2)

$$a + [b] \in \mathbb{Z}, \mathbb{Z} \rightarrow \frac{1}{10} \in \mathbb{Z}$$

$$b - [a] \in \mathbb{Z}, \mathbb{Z} \rightarrow \frac{4}{10} \in \mathbb{Z}$$

با توجه به اینکه جمع جزایهای آن دو کمتر از 1 است

$$a \in \mathbb{Z} + \frac{1}{10}, b \in \mathbb{Z} + \frac{4}{10}$$

$$[a+b] = [a] + [b]$$

$$[a] + [b] \in [a+b] \in \mathbb{Z}$$

$$\left[\underbrace{\quad}_{\substack{\uparrow \\ \text{اجزای صحیح } a}} + \frac{1}{10} + \underbrace{\quad}_{\substack{\uparrow \\ \text{اجزای صحیح } b}} + \frac{4}{10} \right] \in \mathbb{Z} \rightarrow$$

$$\underbrace{\quad}_{\substack{\uparrow \\ \text{اجزای صحیح } a}} + \underbrace{\quad}_{\substack{\uparrow \\ \text{اجزای صحیح } b}} \in \mathbb{Z}$$

$$[a] + [b] \in \mathbb{Z} \Rightarrow$$

$$a+b \in \mathbb{Z}, \mathbb{Z} \checkmark$$

اجزای صحیح a اجزای صحیح b

$$[(1 + \sqrt{2})^4] \in \mathbb{Z}$$

10- 0

$$[(1 + \sqrt{2})^4] + [(1 - \sqrt{2})^4] + \underbrace{(a)}_{\substack{\uparrow \\ \text{جزای صحیح } a}} + \underbrace{(b)}_{\substack{\uparrow \\ \text{جزای صحیح } b}} = 198$$

$$(1 + \sqrt{2})^4 = 198 - (1 - \sqrt{2})^4$$

$$[(1 + \sqrt{2})^4] = [198 - (1 - \sqrt{2})^4] = 198 + [- (1 - \sqrt{2})^4] = \boxed{197}$$

[0-]