

$$\begin{aligned} 1 \quad x > 1 &\rightarrow \frac{1}{x-1} = x-1 \Rightarrow x^2 - 2x + 1 = 1 \Rightarrow x=0, x=2 \\ 2 \quad x < 1 &\rightarrow \frac{1}{x-1} = 1-x \Rightarrow x^2 - 2x + 1 = 0 \Rightarrow \Delta < 0 \end{aligned} \quad \textcircled{1}$$

$$3 \quad \text{الف) } \left| \frac{x-1}{x} \right| < 2 \rightarrow -2 < \frac{x-1}{x} < 2 \rightarrow \frac{x-1-2x}{x} < 0 \rightarrow x > 1 \quad \textcircled{2}$$

$$4 \quad \frac{x-1+x}{x} > 0 \rightarrow \frac{2x-1}{x} > 0 \rightarrow x \in \left(\frac{1}{2}, \infty \right)$$

$$5 \quad \text{ب) } \left| \frac{x-2}{x+1} \right| < 1 \rightarrow \frac{x-2}{x+1} > 1 \rightarrow \frac{-x-3}{x+1} > 0 \rightarrow \frac{-x-3}{-x-1} < 0$$

$$6 \quad \frac{x-2}{x+1} < -1 \rightarrow \frac{x-1}{x+1} < 0 \rightarrow \frac{-x-1}{-x-1} < 0 \rightarrow x \in (-3, -\frac{1}{2})$$

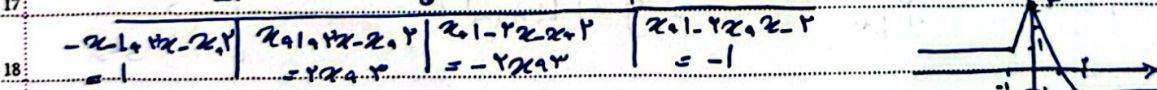
$$7 \quad x^2 < |x+4| \rightarrow x^2 - x - 4 < 0 \quad \textcircled{3}$$

$$8 \quad \rightarrow x^2 + x + 4 > 0 \rightarrow \Delta < 0$$

$$9 \quad |x-\alpha| < \beta \rightarrow -\beta < x-\alpha < \beta \rightarrow \beta+\alpha < x < \beta+\alpha$$

$$10 \quad -2 < x < 2 \rightarrow \begin{cases} \alpha+\beta=2 \\ \alpha-\beta=-2 \end{cases} \rightarrow \alpha = \frac{1}{2}, \beta = \frac{3}{2}$$

$$11 \quad \begin{array}{c|c|c|c} -1 & 0 & 1 & \\ \hline -x+1+x-2 & x+1+x-2 & x+1-x-2 & x+1-x-2 \\ \hline =-1 & =-x+1 & =-1 & =-1 \end{array} \quad \textcircled{4}$$



$$12 \quad \rightarrow \max y = 1, \min y = -1$$

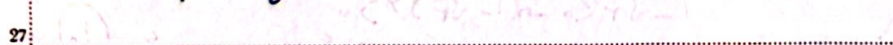
$$13 \quad y' = \left| \frac{1}{x} \right| - 1 = y \quad \left| \frac{1}{x} \right| - 1 = \left| \frac{1}{x} \right| - 1 \quad \textcircled{5}$$

$$14 \quad \hookrightarrow x=1 \quad \hookrightarrow x=1$$

$$15 \quad |x+1|-x = -2 \rightarrow x = -3$$

$$16 \quad \text{الف) } f(x) = [|x-1| - |x+1|] \quad \textcircled{6}$$

$$17 \quad \Rightarrow R_f = \{ -2, -1, 0, 1, 2 \}$$



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$$b) f(x) = \frac{1}{x} - \left\lceil \frac{x+1}{x} \right\rceil = \frac{1}{x} - \left\lceil 1 + \frac{1}{x} \right\rceil = \frac{1}{x} - 1 - \left\lceil \frac{1}{x} \right\rceil$$

$$0 < \frac{1}{x} - \left\lceil \frac{1}{x} \right\rceil < 1 \rightarrow -1 < \frac{1}{x} - \left\lceil \frac{1}{x} \right\rceil - 1 < 0 \rightarrow R = (-1, 0)$$

$$a) y = \lfloor -2x \rfloor - 1, x \in (-1, 1) \rightarrow 2x \in (-2, 2)$$

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

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

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

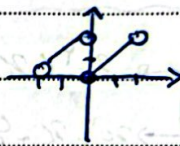
$$\frac{1}{2} < x < 1 \rightarrow y = -3$$



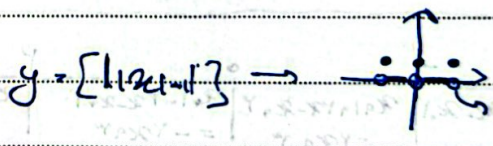
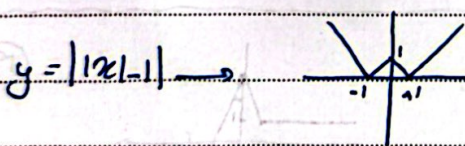
$$b) y = x - 2 \left\lceil \frac{x}{2} \right\rceil, x \in (-2, 2)$$

$$-2 < x < 0 \rightarrow y = x + 2$$

$$0 \leq x < 2 \rightarrow y = x$$

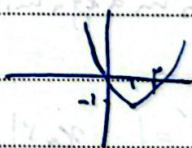


$$a) y = \lfloor |x| + 1 \rfloor, x \in [-2, 2]$$



$$b) y = \lfloor x^2 - 2x \rfloor, x \in [-1, 2]$$

$$y = x^2 - 2x$$



$$a = \lfloor a \rfloor + 0.2 \rightarrow \lfloor a \rfloor + 0.2 + \lfloor b \rfloor = 1.2 \quad \lfloor a \rfloor + \lfloor b \rfloor = 1$$

$$b = \lfloor b \rfloor + 0.4 \rightarrow \lfloor a \rfloor + 0.4 - \lfloor a \rfloor = 0.4 \quad \lfloor b \rfloor - \lfloor a \rfloor = 0.4$$

$$\lfloor b \rfloor = 1, \lfloor a \rfloor = 0 \rightarrow b = 1.4, a = 0.2 \quad a + b = 1.6$$

$$191 - 1 < (1 + \sqrt{2})^6 < 191$$

$$1 - \sqrt{2} < 0 \rightarrow (1 - \sqrt{2})^6 > 0$$

$$191 < (1 + \sqrt{2})^6 < 191 \rightarrow \lfloor (1 + \sqrt{2})^6 \rfloor = 191$$

$$(1 + \sqrt{2})^6 + 191 - (1 - \sqrt{2})^6 < 0$$

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