

$$\frac{1}{n-1} = |n-1| \quad n-1 \neq 0 \rightarrow n \neq 1$$

$$x < 1 \quad x = 1 \quad x > 1$$

$$n - n^2 - 1 + n = 1 \rightarrow (n-1)(1-n) = 1$$

$$\frac{1}{n-1} = -n+1$$

$$\frac{1}{n-1} = n-1 \rightarrow 1 = (n-1)^2 \rightarrow n-1 = \pm 1$$

$$\begin{cases} n-1=1 \rightarrow n=2 \checkmark \\ n-1=-1 \rightarrow n=0 \times \end{cases}$$

$$n - n^2 - 1 + n = 2 \rightarrow n^2 - 2n + 2 = 0 \quad \text{ریشه حقیقی ندارد}$$

معماریه ریشه (۲) دارد

$$| \frac{2n-1}{n} | < 2 \rightarrow -2 < \frac{2n-1}{n} < 2$$

$$\Rightarrow \begin{cases} \frac{2n-1}{n} > -2 \rightarrow \frac{2n-1}{n} + 2 > 0 \rightarrow \frac{2n-1+2n}{n} > 0 \rightarrow \frac{4n-1}{n} > 0 \\ \frac{2n-1}{n} < 2 \rightarrow \frac{2n-1}{n} - 2 < 0 \rightarrow \frac{2n-1-2n}{n} < 0 \rightarrow \frac{-1}{n} < 0 \rightarrow n > 0 \end{cases}$$

$$\frac{1}{+} \frac{1}{-} \frac{1}{+}$$

$$\Rightarrow (-\infty, 0) \cup (\frac{1}{4}, +\infty)$$

$$\Rightarrow (\frac{1}{4}, +\infty)$$

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$$| \frac{n-2}{2n+1} | > 1$$

$$\Rightarrow \begin{cases} \frac{n-2}{2n+1} > 1 \rightarrow \frac{n-2}{2n+1} - 1 > 0 \rightarrow \frac{n-2-2n-1}{2n+1} > 0 \rightarrow \frac{-n-3}{2n+1} > 0 \\ \frac{n-2}{2n+1} < -1 \rightarrow \frac{n-2}{2n+1} + 1 < 0 \rightarrow \frac{n-2+2n+1}{2n+1} < 0 \rightarrow \frac{3n-1}{2n+1} < 0 \end{cases}$$

$$-\frac{3}{+} - \frac{1}{-} \rightarrow (-3, -\frac{1}{2})$$

$$+\frac{1}{+} - \frac{1}{-} \rightarrow (-\frac{1}{2}, \frac{1}{3})$$

$$\Rightarrow (-3, -\frac{1}{2}) \cup (-\frac{1}{2}, \frac{1}{3})$$

$$n^2 < |n+4| \rightarrow |n-a| < \beta \quad a=?$$

$$1) n+4 > 0 \rightarrow n > -4 \Rightarrow n^2 < n+4 \rightarrow n^2 - n - 4 < 0 \rightarrow (n-3)(n+2) < 0$$

$$2) n+4 < 0 \rightarrow n < -4 \Rightarrow n^2 < -(n+4) \rightarrow n^2 + n + 4 < 0 \quad \text{ریشه حقیقی ندارد}$$

$$+\frac{2}{+} - \frac{3}{-} \rightarrow (-2, 3)$$

$$\Rightarrow \text{مجموعه جواب: } (-2, 3) \Rightarrow -2 < x < 3 \rightarrow -2.05 < n-0.5 < 3.05 \rightarrow -1.5 < n < 3.5$$

$$\Rightarrow |n - \frac{1}{2}| < \frac{5}{2} \Rightarrow a = \frac{1}{2}$$

$$f = |n+1| - |2n| + |n-2| \quad \min, \max = ?$$

$$n+1=0 \rightarrow n=-1 \quad 2n=0 \rightarrow n=0 \quad n-2=0 \rightarrow n=2$$

$$\begin{array}{c} | \\ \hline -1 \quad 0 \quad 2 \\ \hline \end{array}$$

$$n < -1 \rightarrow -(n+1) - (-2n) + (-(n-2)) = -n-1+2n-n+2 = 1$$

$$-1 < n < 0 \rightarrow (n+1) - (-2n) + (-(n-2)) = n+1+2n-n+2 = 2n+3 \xrightarrow{n=0} 3$$

$$0 < n < 2 \rightarrow (n+1) - (2n) + (-(n-2)) = n+1-2n-n+2 = -2n+3 \xrightarrow{n=0} 3$$

$$n > 2 \rightarrow (n+1) - (2n) + (n-2) = n+1-2n+n-2 = -1$$

$$\Rightarrow \max = 3, \min = -1 \quad \max + \min = 3 + (-1) = 2$$

$$f = |\frac{1}{2}n| - 2 \rightarrow \text{ادامه طریقه} \rightarrow \text{ادامه طریقه}$$

$$y = |\frac{1}{2}n| - 2 \rightarrow y = |\frac{n+4}{2}| - 2 + 1 \rightarrow y = |\frac{n+4}{2}| - 1$$

$$\text{نقطه تقاطع: } |\frac{1}{2}n| - 2 = |\frac{n+4}{2}| - 1 \rightarrow |\frac{n}{2}| - |\frac{n+4}{2}| = 1$$

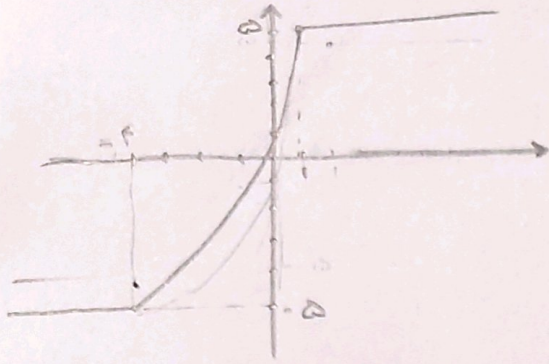
$$\frac{1}{+} - \frac{1}{-} \rightarrow x = -2, -3$$

$$n < -4 \rightarrow -(\frac{n}{2}) - (-\frac{n+4}{2}) = 1 \rightarrow -\frac{n}{2} + \frac{n+4}{2} = 1 \rightarrow \frac{4}{2} = 1 \quad \times$$

$$-4 < n < 0 \rightarrow -(\frac{n}{2}) - (\frac{n+4}{2}) = 1 \rightarrow -\frac{n}{2} - \frac{n+4}{2} = 1 \rightarrow -\frac{2n+4}{2} = 1 \rightarrow -2n-4 = 1 \rightarrow -2n = 5 \rightarrow n = -2.5$$

$$n > 0 \rightarrow \frac{n}{2} - \frac{n+4}{2} = 1 \rightarrow \frac{-4}{2} = 1 \quad \times$$

الف) $f(x) = [1-x] - [x+1]$ $\rightarrow$ $\begin{cases} x < -1 \rightarrow f(x) = [1-x - (-(x+1))] = [1-x+x+1] = [2] \rightarrow f(x) = 2 \\ -1 < x < 1 \rightarrow f(x) = [1-x - (x+1)] = [1-x-x-1] = [-2x-2] \\ x > 1 \rightarrow f(x) = [-(1-x) - (x+1)] = [x-1-x-1] = [-2] \end{cases}$ (سوال 4)

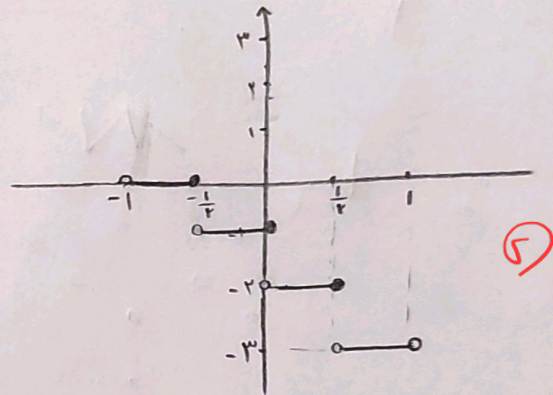


$\Rightarrow R_f = \{-2, -1, 0, 1, 2\} = [-2, 2]$

ب) $f(x) = \frac{1}{x} - [\frac{x+1}{x}] \rightarrow \frac{1}{x} - 1 - [\frac{1}{x}] = \frac{1}{x} - [\frac{1}{x}] - 1 \Rightarrow R_f = [-1, 0)$
 $\Rightarrow R_f = [-1, 0)$

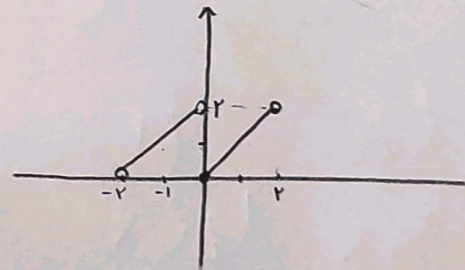
الف) $y = [-2x] - 1 \quad x \in (-1, 1)$

$-1 < x \leq -\frac{1}{2} \rightarrow [-2x] = 1 \rightarrow y = 1 - 1 = 0$
 $-\frac{1}{2} < x \leq 0 \rightarrow [-2x] = 0 \rightarrow y = 0 - 1 = -1$
 $0 < x \leq \frac{1}{2} \rightarrow [-2x] = -1 \rightarrow y = -1 - 1 = -2$
 $\frac{1}{2} < x < 1 \rightarrow [-2x] = -2 \rightarrow y = -2 - 1 = -3$

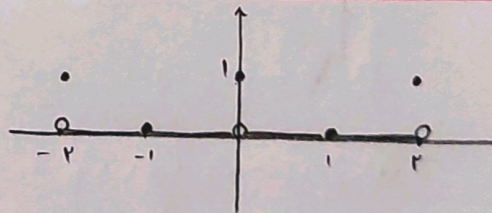
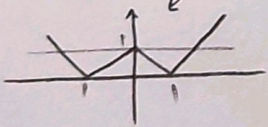


ب) $y = x - 2[\frac{x}{2}] \quad x \in (-2, 2)$

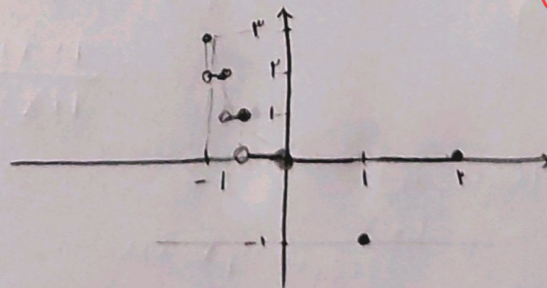
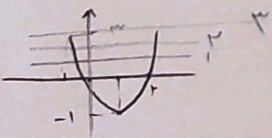
$-2 < x < 0 \rightarrow [\frac{x}{2}] = -1 \rightarrow y = x - 2(-1) = x + 2$
 $0 \leq x < 2 \rightarrow [\frac{x}{2}] = 0 \rightarrow y = x - 2(0) = x$



الف) $y = [|x| - 1]$ $x \in [-2, 2]$



ب) $y = [x^2 - 2x]$ $x \in [-1, 2]$



سوال ۹

$$a + [b] = ۴,۲ \quad b - [a] = ۲,۴ \quad a + b = ?$$

$$b - [a] = ۲,۴ \rightarrow b - ۲,۴ = [a] \rightarrow a = ۱,۲$$

$$a + [b] = ۴,۲ \rightarrow ۴,۲ - a = [b] \rightarrow b = ۳,۴$$

$$a + b = ۱,۲ + ۳,۴ = \boxed{۴,۶}$$

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

$$\downarrow \approx$$
$$(1 - ۱,۴۱) \approx (-۰,۴۱)^4 \rightarrow \boxed{0} < 1$$

سوال ۱۰

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