

$$الف) y = x + |2x - 4|$$

1- 5

$$x \geq 2 \rightarrow 2x - 4 \geq 0 \rightarrow y = x + (2x - 4) = 3x - 4 \rightarrow R = [2, +\infty)$$

$$x < 2 \rightarrow 2x - 4 < 0 \rightarrow y = x - (2x - 4) = -x + 4 \rightarrow R = (-\infty, 2)$$

$$\text{در نهایت} \rightarrow R = [2, +\infty)$$

$$ب) y = |x - 2| + |x - 1| - |x|$$

$$x \geq 2 \rightarrow y = (x - 2) + (x - 1) - x = x - 3 \rightarrow R = [-1, +\infty)$$

$$1 \leq x < 2 \rightarrow y = (2 - x) + (x - 1) - x = 1 - x \rightarrow R = (-1, 0]$$

$$0 \leq x < 1 \rightarrow y = (2 - x) + (1 - x) - x = 3 - 3x \rightarrow R = [0, 3]$$

$$x < 0 \rightarrow y = (2 - x) + (1 - x) - (-x) = 3 - x \rightarrow R = (3, +\infty)$$

$$\text{در نهایت} \rightarrow [-1, +\infty)$$

$$|3x - 3| - |x + 2| = k$$

2- 5

$$3x - 3 = 0 \rightarrow x = 1 \quad x + 2 = 0 \rightarrow x = -2$$

$$① x \geq 1 \rightarrow k = (3x - 3) - (x + 2) = 2x - 5 \rightarrow x = \frac{k + 5}{2}$$

$$② -2 \leq x < 1 \rightarrow k = (-3x + 3) - (x + 2) = -4x + 1 \rightarrow x = \frac{1 - k}{4}$$

$$③ x < -2 \rightarrow k = (-3x + 3) - (-x - 2) = -2x + 5 \rightarrow x = \frac{5 - k}{2}$$

$$① \Rightarrow k \geq -3 \quad ② \Rightarrow -3 < k < 9 \quad ③ \Rightarrow k > 9$$

در قسمت ② و ③ در هر حالت ۲ ریشه داریم اما در قسمت ① فقط وقتی  $k = -3$  است

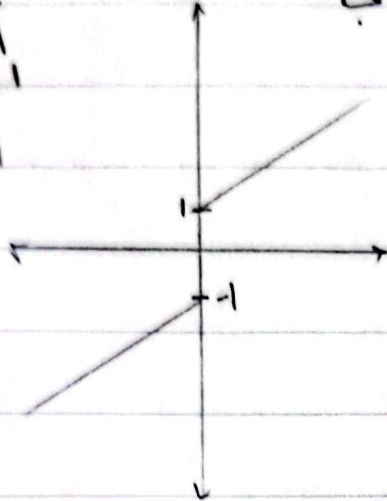
یک ریشه داریم و در بقیه اعداد ریشه‌ای وجود ندارد.

$$\text{حواص} \Rightarrow k = -3$$

الف)  $y = x + \frac{x}{|x|}$

$x > 0 \rightarrow y = x + 1$

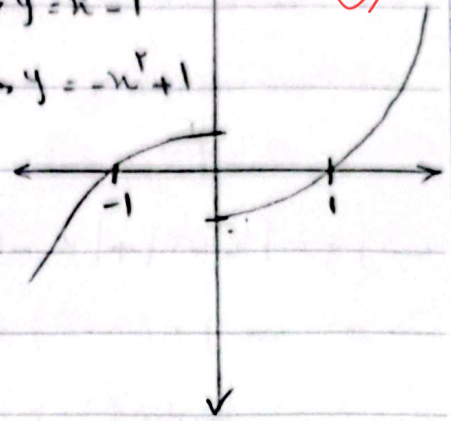
$x < 0 \rightarrow y = x - 1$



ب)  $y = x|x| = \frac{x^2}{|x|}$

$x > 0 \rightarrow y = x^2$

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



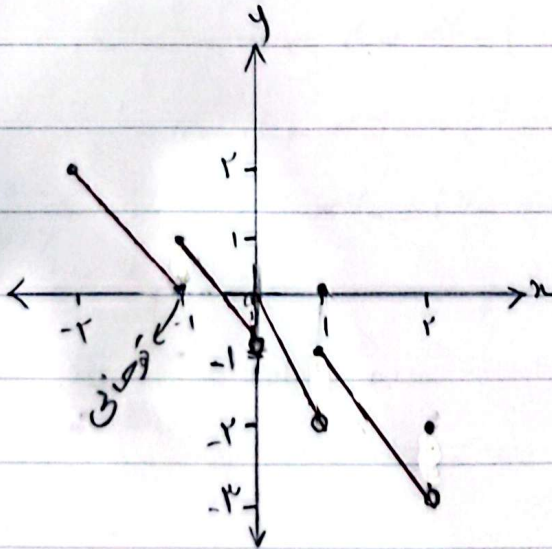
الف)  $y = [x] - 2x$

$-2 \leq x < -1 \rightarrow [x] = -2$

$-1 \leq x < 0 \rightarrow [x] = -1$

$0 \leq x < 1 \rightarrow [x] = 0$

$1 \leq x < 2 \rightarrow [x] = 1$



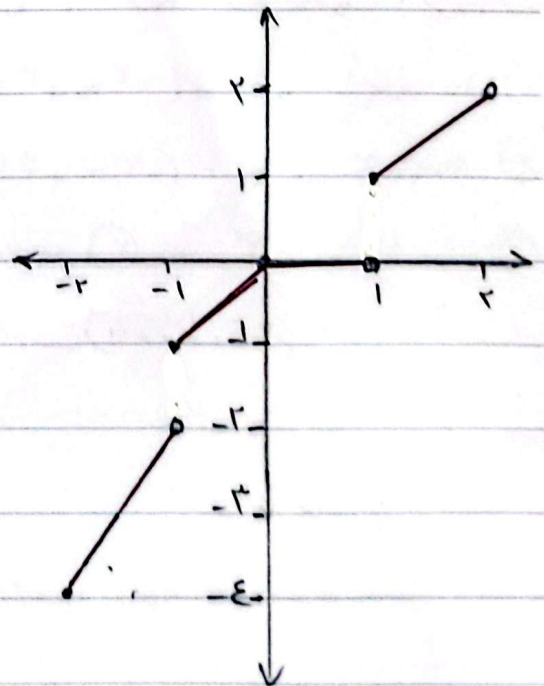
ب)  $y = [x]|x|$

$-2 \leq x < -1 \rightarrow [x] = -2$

$-1 \leq x < 0 \rightarrow [x] = -1$

$0 \leq x < 1 \rightarrow [x] = 0$

$1 \leq x < 2 \rightarrow [x] = 1$



الف)  $2n - [2n] = y \rightarrow [0, 1)$

ب)  $4n - 4[n] = y \rightarrow [0, 4)$

ج)  $x - \delta \left[ \frac{x}{\delta} \right] = y \rightarrow [0, \delta)$

د)  $y = [2n] - 2n \rightarrow (-1, 0]$

5

الف)  $y = 2 \sin n + 2 \cos n \rightarrow [-\sqrt{12}, \sqrt{12}]$

ب)  $y = 4 \sin n - 2 \cos n \rightarrow [-5, 5]$

ج)  $y = [2 \sin n + 2 \cos n] \rightarrow \{ \pm 4, \pm 2, \pm 1, 0 \}$

د)  $y = \sqrt{\cos n - 2 \sin n} \rightarrow [0, \sqrt{5}]$

1, 10

الف)  $y = \sin^2 n + 2 \sin n + 2$

$y = t^2 + 2t + 2 \rightarrow t \in [-1, 1] \Rightarrow R = [2, 4]$

min  $\rightarrow 0$  max  $= 4$

ب)  $y = 2 \sin^2 n + 2 \sin n + 2$

$y = 2t^2 + 2t + 2 \rightarrow t \in [-1, 1] \Rightarrow R = [-1, 4]$

$\sin n = 1 \rightarrow \sqrt{1}$   
 $\sin n = -1 \rightarrow -1$   
 $\sin n = -\frac{1}{2} \rightarrow -\frac{\sqrt{3}}{2}$

$R = \left[ \frac{1}{2}, \frac{1}{2} \right]$

الف)  $y = \sin^2 n + 2 \cos^2 n \rightarrow \sin^2 n + \cos^2 n + \cos^2 n$

$\hookrightarrow 1 + \cos^2 n$

$R = [1, 2]$

ب)  $y = \frac{2 \cot n}{1 + \cot^2 n} \rightarrow y = 2 \sin n \cos n = \sin 2n$

$\hookrightarrow R = [-1, 1]$

5

الف)  $y = \sin^4 x + \cos^4 x$

-9

$\hookrightarrow 1 - 2\sin^2 x \cos^2 x \quad \} \rightarrow R = [0, 1]$

$\hookrightarrow \sin^2 x \cos^2 x \in [0, 1/4]$

1, 0

ب)  $y = [\sin^4 x + \cos^4 x]$

$\hookrightarrow 1 - 2 \leq y \leq 1 \rightarrow R_f = [0, 1]$

$R = \{0, 1\}$

الف)  $y = \frac{2x^2 + 7x - 4}{x + 4} \rightarrow \frac{2(x-1)(x+4)}{(x+4)}$

-10

1, 0

$R = R - \{4\}$

$\hookrightarrow y = \frac{x^2 - 1}{x - 1} \rightarrow \frac{(x-1)(x+1)}{x-1} \rightarrow R = [1, \infty) - \{1\}$

$x \neq 1$

الصورة البيانية

