

۱. تجزیه و تحلیل

۲. نمودار

۳. نمودار

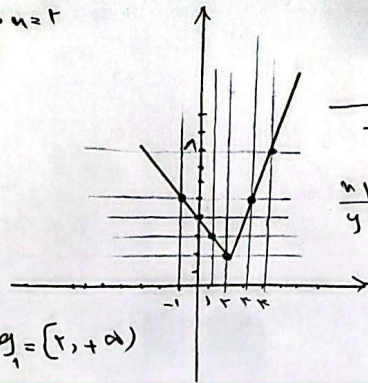
۴. نمودار

$$f(x) = x + |x - 2|$$

$$f(x) = x + |x - 2|$$

	x	$x - 2$	$ x - 2 $	$f(x)$
x	x	$x - 2$	$2 - x$	2
x	x	$x - 2$	$x - 2$	$2x - 2$

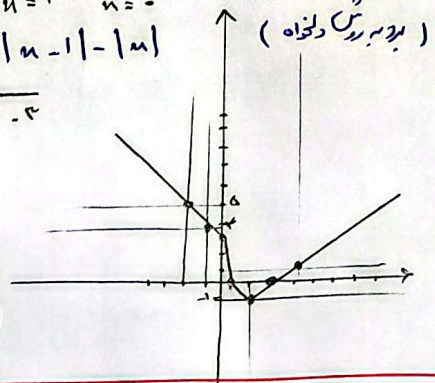
$$R_{y_1} = [2, +\infty)$$



$$f(x) = |x - 2| + |x - 1| + |x|$$

	x	$x - 2$	$x - 1$	x	$f(x)$
x	x	$x - 2$	$x - 1$	x	$3x - 3$
x	x	$x - 2$	$1 - x$	x	1
x	x	$2 - x$	$x - 1$	x	1
x	x	$2 - x$	$1 - x$	x	$2 - 2x$

$$R_{y_1} = [-1, +\infty)$$



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$$|x - 2| - |x + 1| = k$$

$$x = 1 \quad x = -2$$

$$-2$$

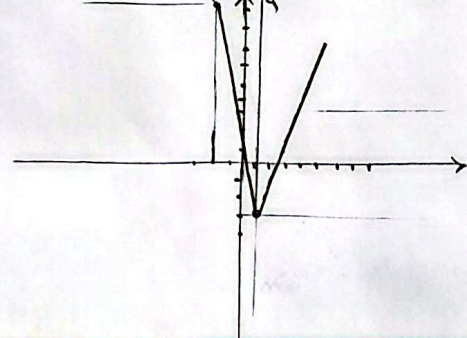
$$1$$

	x	$x - 2$	$x + 1$	$f(x)$
x	x	$x - 2$	$x + 1$	$2x - 1$
x	x	$x - 2$	$1 - x$	1
x	x	$2 - x$	$x + 1$	1
x	x	$2 - x$	$1 - x$	$2 - 2x$

$$\Rightarrow \min f(x) \Rightarrow x = 1$$

$$f(1) = |1 - 2| - |1 + 1| = 1 - 2 = -1 \quad k = -1$$

(نمودار تابع)



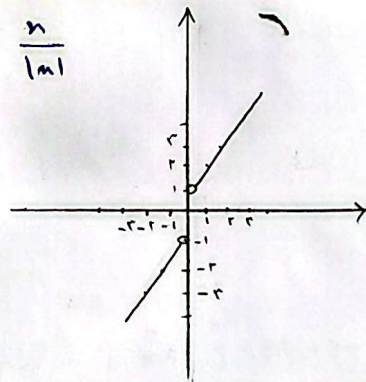
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$$f(x) = x + \frac{x}{|x|}$$

$$x - 1 \quad x + 1$$

x	x	x	$f(x)$
x	x	x	$2x$
x	x	$-x$	0

x	x	x	$f(x)$
x	x	x	$2x$
x	x	$-x$	0



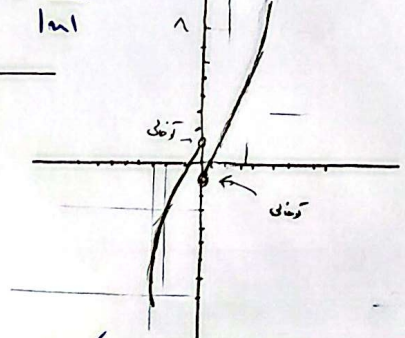
$$f(x) = x|x| - \frac{x}{|x|}$$

$$-x^2 + 1 \quad x^2 - 1$$

x	x	x	$f(x)$
x	x	x	x^2
x	x	$-x$	$-x^2$

x	x	x	$f(x)$
x	x	x	x^2
x	x	$-x$	$-x^2$

(نمودار تابع)



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$$f(x) = [x] - x$$

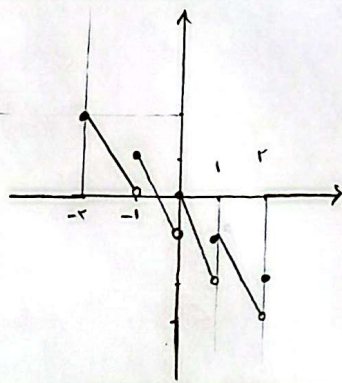
$$x = 2 \Rightarrow y = -2$$

$$1 \leq x < 2 \Rightarrow y = -1$$

$$0 \leq x < 1 \Rightarrow y = 0$$

$$-1 \leq x < 0 \Rightarrow y = 1$$

$$-2 \leq x < -1 \Rightarrow y = 2$$



$$[x] |x|$$

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

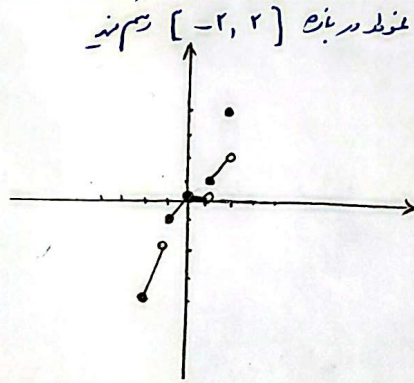
$$x = 1 \Rightarrow y = 1$$

$$1 \leq x < 2 \Rightarrow y = 1$$

$$0 \leq x < 1 \Rightarrow y = 0$$

$$-1 \leq x < 0 \Rightarrow y = -1$$

$$-2 \leq x < -1 \Rightarrow y = -2$$



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$$f(x) = x - [x]$$

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

$$R_{y_1} = [0, 1)$$

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

$$f(x) = x - [x]$$

$$R_{y_1} = [0, 1)$$

$$R_{y_2} = [-1, 0]$$

(نمودار تابع)

$$f(x) = [x] - x$$

$$R_{y_1} = [-1, 0]$$

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$$f(x) = x - a \left[\frac{x}{a} \right]$$

$$a \left(\frac{x}{a} \right) - a \left[\frac{x}{a} \right] \Rightarrow a \left(\frac{x}{a} - \left[\frac{x}{a} \right] \right)$$

$$R_{y_1} = [0, a)$$

ا) $y = r \sin n + r \cos n$

$-\sqrt{r+r} \leq r \sin n + r \cos n \leq \sqrt{r+r}$

$Ry_1 = [-\sqrt{r}, \sqrt{r}]$

ج) $y = [r \sin n + r \cos n]$

$-\sqrt{r+r} \leq r \sin n + r \cos n \leq \sqrt{r+r}$

$[-\sqrt{r}, \sqrt{r}] \Rightarrow Ry_1 = \{y | y \in \mathbb{Z}, -r \leq y \leq r\}$

ب) $y = r \sin n - r \cos n$

$-\sqrt{r+(-r)} \leq r \sin n - r \cos n \leq \sqrt{r+(-r)}$

$Ry_1 = [-r, r]$

د) $y = \sqrt{\cos n - r \sin n}$

$-r \leq \cos n - r \sin n \leq r$

$[-r, r] \Rightarrow Ry_1 = [0, \sqrt{r}]$

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ا) $y = \sin^2 n + r \sin n + r$

$\frac{-b}{r} \Rightarrow \frac{-r}{r} \Rightarrow y = -\frac{1}{r} \rightarrow j \in \mathbb{Z}$

$n = -1 \Rightarrow y = 0$

$n = 1 \Rightarrow y = r$

$Ry_1 = [0, r]$

ب) $y = r \sin^2 n + r \sin n + r$

$\frac{-b}{r} = \frac{-r}{r} \rightarrow y = \frac{1}{r}$

$n = -1 \rightarrow y = 1$

$n = 1 \rightarrow y = r$

$Ry_1 = [\frac{1}{r}, r]$

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ا) $y = \sin^2 n + r \cos^2 n$

$\frac{\sin^2 + \cos^2 + r \cos^2}{1} \Rightarrow Ry_1 = [1, r]$

$0 \leq \cos^2 \leq 1$

ب) $y = \frac{r \cos^2 n}{1 + \cos^2 n}$

$\frac{\frac{r \cos^2}{\sin^2}}{\frac{1}{\sin^2}} = \frac{r \cos^2 \sin^2}{\sin^2} = r \cos^2 \sin^2$

$\sin^2 n \Rightarrow$

$Ry_1 = [-1, 1]$

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ا) $y = \sin^4 n + \cos^4 n$

$r^{1-r} \leq \sin^4 n + \cos^4 n \leq 1 \Rightarrow \frac{1}{r} \leq \sin^4 n + \cos^4 n \leq 1$

$Ry_1 = [\frac{1}{r}, 1]$

ب) $y = [\sin^4 n + \cos^4 n]$

$r^{1-r} \leq \sin^4 n + \cos^4 n \leq 1$

$\frac{1}{r} \leq \sin^4 n + \cos^4 n \leq 1$

$Ry_1 = \{0, 1\}$

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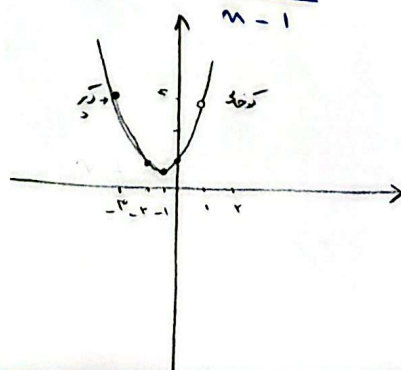
ا) $y = \frac{r n^r + V n - r}{n + r}$

$\frac{(n+r)(r n - 1)}{(n+r)} = r n - 1$

$n + r \Rightarrow y \neq -r$

$Ry_1 = \mathbb{R} - \{-r\}$

ب) $y = \frac{n^r - 1}{n - 1}$



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

$n \neq 1, y \neq r$

$Ry_1 = [\frac{r}{r}, +\infty)$

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