

الف) $y = \frac{|x|+1}{|x|-x}$

$\frac{a+b}{c+d} \rightarrow \frac{1+|x|}{|x|-x}$

$\frac{1+|x|}{|x|-x} \rightarrow \frac{1}{x}$ (منخرج می‌شود)

$R = (-\infty, -\frac{1}{x}] \cup (1, +\infty)$

ب) $y = \frac{x^2+1}{|x|} \leq |x| + \frac{1}{|x|}$

$\frac{1}{a} \geq \frac{1}{b} \Rightarrow a \geq b$ (با $a, b > 0$)

$R = (-\infty, +\infty) \subset \mathbb{R}$

ج) $y = \frac{x^2+x-2}{x^2+x} \Rightarrow y \leq \frac{x^2+x-2}{x^2+x}$

$\frac{x^2+x-2}{x^2+x} \leq \frac{x^2+x-2}{x^2+x} \Rightarrow \Delta \leq b^2 - 4ac = (x-y)^2 - 4(-x-y)$

$\Delta \geq 0 \Rightarrow y^2 + 4y + 1 \geq 0$

$R = (-\infty, -2] \cup [-1, +\infty)$

د) $f(x) = \frac{x^2-x+\frac{1}{x}}{x^2-x+1} \leq (x-\frac{1}{x})^2 \Rightarrow y \leq \frac{x^2-x+\frac{1}{x}}{x^2-x+1}$

$\Delta \leq b^2 - 4ac = (1-y)^2 - 4(y-\frac{1}{y})(y-1) = -3y^2 + 4y$

$\Delta \geq 0 \Rightarrow -3y^2 + 4y \geq 0 \Rightarrow y \in [0, \frac{4}{3}]$

ه) $y \leq \log \frac{x^2-x+1}{x} \leq \log (x+\infty) \Rightarrow R \subset \mathbb{R}$

$R \subset \mathbb{R}$

و) $y \leq \log \frac{x^2+1}{x} \leq \log \frac{x^2+1}{x} \Rightarrow R \subset \mathbb{R}$

$R \subset \mathbb{R}$

ز) $y \leq \sqrt{-x^2+x-1} \Rightarrow R \subset \sqrt{-x^2+x-1} \Rightarrow R \subset [0, \sqrt{3}]$

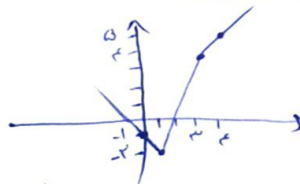
$R \subset [0, \sqrt{3}]$

ح) $y \leq \sqrt{x^2-x-1} \Rightarrow R \subset \sqrt{x^2-x-1} \Rightarrow R \subset [1, +\infty)$

$R \subset [1, +\infty)$

ط) $y \leq |x^2-x| - |x-1|$

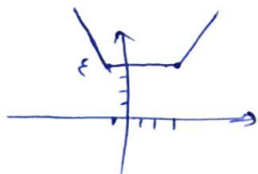
$|x^2-x| - |x-1|$



$R \subset [-1, +\infty)$

ث) $y \leq |x^2-x| + |x+1|$

$|x^2-x| + |x+1|$



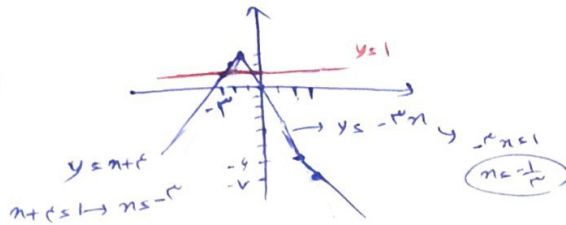
$R \subset [1, +\infty)$

اضداد
درست

(7)

$$|x-2| - |x+2| \leq 1$$

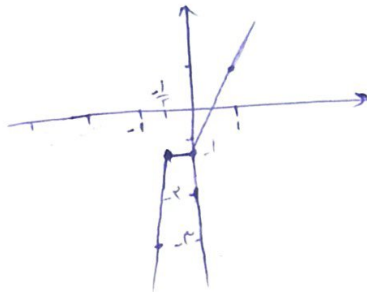
$$|x|, |x|, |x|, |x|$$



$$(-\infty, -2] \cup [-\frac{1}{2}, +\infty)$$

$$y \leq x - |x+1| + |x|$$

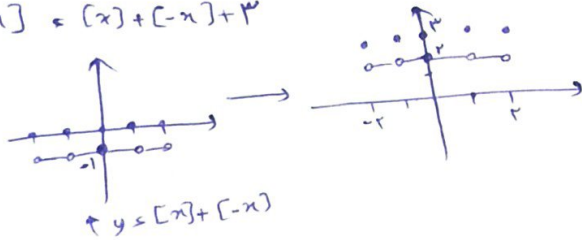
$$|-\frac{1}{2}|, |-\frac{1}{2}|, |-\frac{1}{2}|, |-\frac{1}{2}|$$



$$R_y \leq R$$

(8)

$$y \leq [x] + [x-n] \leq [x] + [-x] + 3$$



$$R \leq \{r, r\}$$

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$$\Rightarrow y \leq x - [x]$$

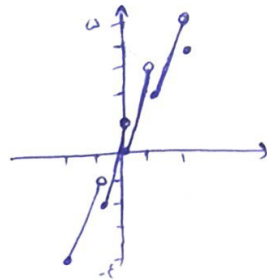
$$(-2, 2) \rightarrow x + \frac{1}{2}$$

$$(-1, 0) \rightarrow x + 1$$

$$(0, 1) \rightarrow x$$

$$(1, 2) \rightarrow x - 1$$

$$\{x\} \rightarrow x$$



$$R \leq [-r, 0]$$

$$y \leq \sin^2 x - \sin x + 1$$

$$\frac{b}{a} \leq \frac{1}{r} \leq \frac{1}{r} - \frac{1}{r} + 1 \leq \frac{r}{r}$$

$$R \leq [\frac{r}{r}, r]$$

$$\Rightarrow y \leq \sin^2 x + \sin^2 x + 1$$

$$\frac{b}{a} \leq -\frac{1}{r} \leq -\frac{1}{r} \leq -\frac{r}{r}$$

$$R \leq [1, r]$$

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