

الف) $y = \frac{|x|+1}{|x|-2} \xrightarrow{t=|x|} y = \frac{t+1}{t-2} \rightarrow y(t-2) = t+1$

$y(t-2) = t+1 \rightarrow t(y-1) = 2y+1$

$t = \frac{2y+1}{y-1} \geq 0 \quad \frac{-\frac{1}{y}}{+1 - \frac{1}{y}}$

$t=|x| \geq 0 \quad x \neq -1$

$R = (-\infty, -\frac{1}{2}] \cup (1, \infty)$

ب) $y = \frac{x^2+1}{|x|} = |x| + \frac{1}{|x|} \xrightarrow{x>0} |x| + \frac{1}{x} \geq 2$

$R = [2, \infty)$

(۲)

$y = \frac{x^2+2x-2}{x+3}$

$y(x+3) = x^2+2x-2$

$x^2 + (3-y)x - (2+3y) = 0$

$\Delta \geq 0 : (3-y)^2 - 4(-2-3y) \geq 0$

$y^2 + 14y + 17 \geq 0 \quad \frac{-14 - 12}{+14 - 12}$

$R = (-\infty, -4] \cup [-\frac{1}{2}, \infty)$

سوال (۲) (۲)

الف) $f(x) = \frac{x^2-x+\frac{1}{x}}{x^2-x+1}$

$D_f: x^2-x+1 \neq 0$

$\Delta: 1-4 = -3 < 0$ هیچ وقت صفر نمی شود

$D_f = \mathbb{R}$

سوال (۲) (۲)

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

$t = (x-\frac{1}{x})^2 \geq 0 \quad f(x) = \frac{t}{t + \frac{1}{x}} \xrightarrow{t=0} f(x) = 0$

$\xrightarrow{t \rightarrow +\infty} f(x) \rightarrow 1$

$R_f = [0, 1]$

هیچ وقت ۱ نمی رسد

الف) $y = \sqrt{-x^2+x-1}$ $\begin{cases} x_{\min} = \frac{-b}{2a} = \frac{-1}{-2} = \frac{1}{2} \\ y_{\min} = -\frac{1}{4} + \frac{1}{4} - 1 = -1 \end{cases}$

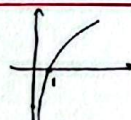
$a < 0 \rightarrow R: [-\infty, 1] = [0, 1]$

(۲)

ب) $y = \sqrt[3]{x^2-4x} \quad a > 0 \rightarrow \begin{cases} x_{\min} = \frac{-b}{2a} = \frac{2}{1} = 2 \\ y_{\min} = 2 - 4 = -2 \end{cases}$

$R: \sqrt[3]{[-4, +\infty)} = [-2, +\infty)$

الف) $y = \log(x^2-x+1)$ $\mathbb{R}$ داخل و خارج



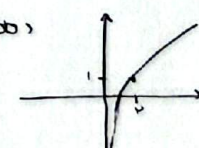
$R: (-\infty, +\infty) = \mathbb{R}$

سوال (۲) (۲)

ب) $y = \log_p(\frac{x^2+1}{x})$

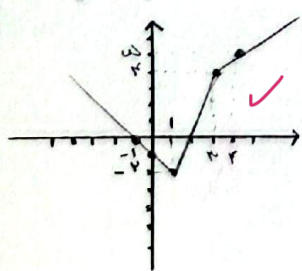
محدودیت داخلی: $x + \frac{1}{x} \xrightarrow{x \rightarrow 0} R: (-\infty, -2] \cup [2, +\infty) \Rightarrow [2, +\infty)$

محدودیت خارجی: $x + \frac{1}{x} \xrightarrow{x \rightarrow \infty} \infty$



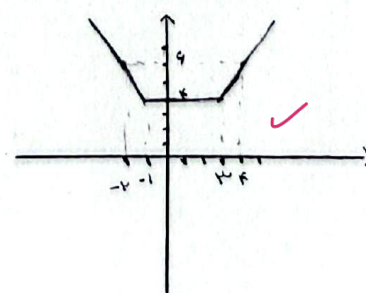
$R: [2, +\infty)$

الف) $y = |x^2-2| - |x-3|$



$R_f: [-2, +\infty)$

ب) $y = |x-3| + |x+1|$



$R_f: [4, +\infty)$

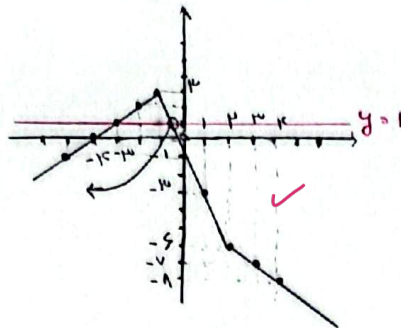
تابع تصادفی سوال (۲) (۲)

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

$-x + y + y - x + 1$	$-x + y - x + y - 1$	$x - y - x - y - 1$
$x + y$	$-x - y$	$-x - y$

$$-y - x = 1$$

$$x = -\frac{1}{y}$$

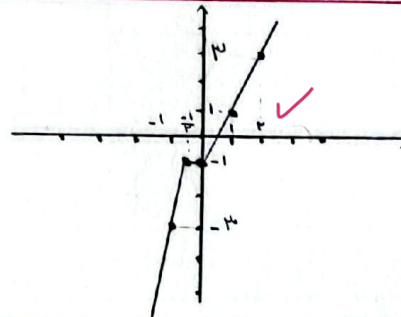


$$= y \text{ جوابات ناممکنه : } (-\infty, -3] \cup [-\frac{1}{3}, +\infty)$$

سوال ٧ (٢)

$$y = 3x - |3x + 1| + |x|$$

$3x + 3x + 1 + x$	$3x - 3x - 1 - x$	$3x - 3x - 1 + x$
$7x + 1$	-1	$x - 1$



$$R_f = \mathbb{R}$$

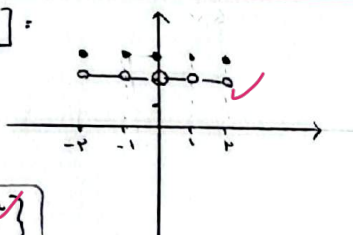
سوال ٨ (٢)

$$الف) y = [x] + [3 - x]$$

$$= [x] + [-x] + 3$$

$$R = \{-1, 0\}$$

$$R_f = \{2, 3\}$$



$$\rightarrow 3x - [x]$$

$$x = 2 \rightarrow 3x - 2$$

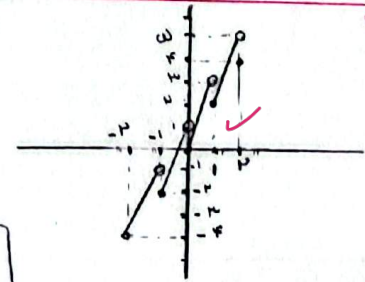
$$1 \leq x < 2 \rightarrow 3x - 1$$

$$0 \leq x < 1 \rightarrow 3x$$

$$-1 \leq x < 0 \rightarrow 3x + 1$$

$$-2 \leq x < -1 \rightarrow 3x + 2$$

$$R_f = [-2, 6]$$



سوال ٩ (٢)

$$الف) y = \sin^2 x + \sin x + 1$$

$$\sin x = 1 \rightarrow 1 - 1 + 1 = 1$$

$$\sin x = -1 \rightarrow 1 + 1 + 1 = 3$$

$$\sin x = \frac{1}{2} \rightarrow \frac{1}{4} - \frac{1}{2} + 1 = \frac{3}{4}$$

$$R = [\frac{3}{4}, 3]$$

$$ب) \sin^2 x + \sin^2 x + 1 = (\sin^2 x)^2 + \sin^2 x + 1$$

$$\sin^2 x = 1 \rightarrow 1 + 1 + 1 = 3$$

$$\sin^2 x = 0 \rightarrow 0 + 0 + 1 = 1$$

$$\sin^2 x = \frac{1}{2} \rightarrow \frac{1}{4} + \frac{1}{2} + 1 = \frac{5}{4}$$

$$R = [1, 3]$$

سوال ١٥ (٢)