

الف) $y = \frac{|x|+1}{|x|-2} \xrightarrow{t=|x|} y = \frac{t+1}{t-2} \rightarrow y(t-2) = t+1$
 $yt - 2y = t+1 \rightarrow t(y-1) = t+1$
 $t = \frac{t+1}{y-1} \geq 0 \quad \frac{-\frac{1}{y-1}}{+1 - \frac{1}{y-1}}$
 $t=|x| \geq 0 \quad \text{و } x \leftarrow$
 $R = (-\infty, -\frac{1}{3}] \cup (1, +\infty)$

ب) $y = \frac{x^2+1}{|x|} = |x| + \frac{1}{|x|} \xrightarrow{x \geq 0} |x| + \frac{1}{|x|} \geq 2$
 $R = [2, +\infty)$

$y = \frac{x^2+2x-2}{x+3}$
 $yn + 3y = n^2 + 2n - 2$
 $n^2 + (2-3y)n - (2+3y) = 0$
 $\Delta \geq 0 : (2-3y)^2 - 4(-2-3y) \geq 0$
 $y^2 + 4y + 12 \geq 0 \quad \frac{-4 \pm \sqrt{16-48}}{2} = \frac{-4 \pm 4i}{2} = -2 \pm 2i$

$R = (-\infty, -4] \cup [-2, +\infty)$

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

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

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

$D_f = \mathbb{R}$

$f(x) = \frac{(x-\frac{1}{x})^2}{(x-\frac{1}{x})^2 + \frac{4}{x}}$

$t = (x-\frac{1}{x})^2 \geq 0 \quad f(x) = \frac{t}{t + \frac{4}{x}} \xrightarrow{t=0} f(x) = 0$
 $\xrightarrow{t \rightarrow +\infty} f(x) \rightarrow 1$
 هیچ وقت 1 نمی رسد

$R_f = [0, 1)$

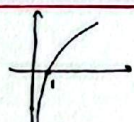
الف) $y = \sqrt{-x^2+x-1}$
 $\begin{cases} x_{\min} = \frac{-b}{2a} = \frac{-1}{-2} = \frac{1}{2} \\ y_{\min} = -\frac{1}{4} + \frac{1}{4} - 1 = -1 \end{cases}$

$a < 0 \rightarrow R: [-\infty, 1] = [0, \sqrt{3}]$

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

$R: \sqrt[3]{[-1, +\infty)} = [-1, +\infty)$

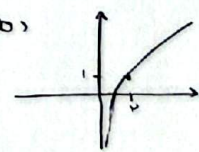
الف) $y = \log(x^2-x+1)$
 در تمام نقاط
 داخل $\mathbb{R}$ مثبت است



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

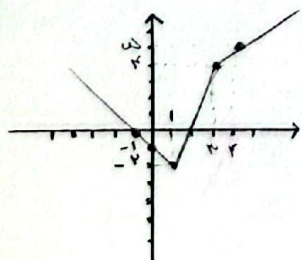
ب) $y = \log_p(\frac{x^2+1}{x})$

محدوده تعریف: $x + \frac{1}{x} > 0 \xrightarrow{x > 0} R: (-\infty, -2] \cup [2, +\infty) \Rightarrow [2, +\infty)$
 چون داخل تعریف باید مثبت باشد
 مثبت منفی مثبت و منفی



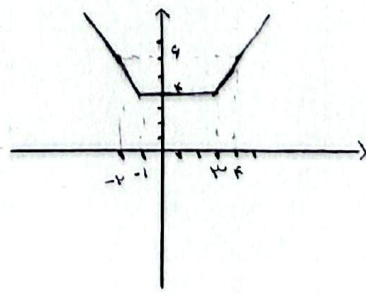
$R: [1, +\infty)$

الف) $y = |x^2-2| = |x-2|$



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

ب) $y = |x-3| + |x+1|$



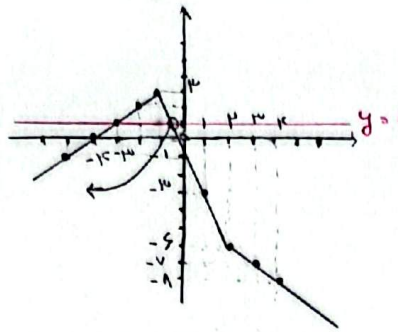
$R_f: [4, +\infty)$

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

-1	2
$-x+2+2x+1$	$-x+2x+2x-1$
$x+3$	$x-1$

$$-3x = 1$$

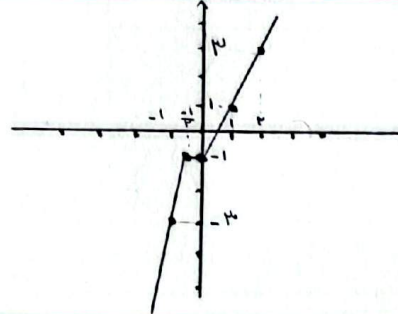
$$x = -\frac{1}{3}$$



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

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

$-\frac{1}{3}$	0
$3x+3x+1$	$3x-3x-1$
$6x+1$	$x-1$



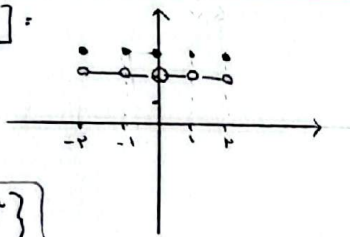
$$R_f = \mathbb{R}$$

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

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

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

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



$$3x - [x]$$

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

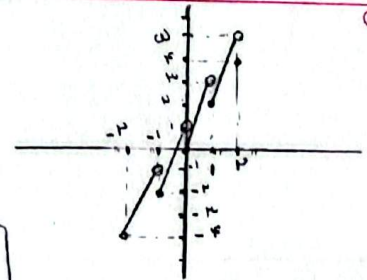
$$1 \leq x < 2 \rightarrow 3x - 1$$

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

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

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

$$R_f = [-2, \infty)$$



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

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

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

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

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

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

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

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

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

$$R = [1, 3]$$