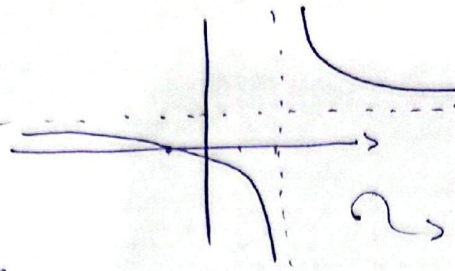


$$y = \frac{|x|+1}{|x|-2}$$



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

سوال ۱: (۲)

$$y = \frac{x^2+1}{|x|} \xrightarrow{x>0} x + \frac{1}{x} \rightarrow [2, +\infty)$$

$$x<0 \rightarrow -x - \frac{1}{x} \rightarrow [2, +\infty)$$

$$\left. \begin{array}{l} x>0 \\ x<0 \end{array} \right\} [2, +\infty)$$

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

$$x^2+x(2-y)-2-2y=0 \rightarrow x = \frac{2-y \pm \sqrt{(2-y)^2+4y+8}}{2}$$

$$\Delta = (2-y)^2 - 4x(-2-2y) = 4+y^2-4y+8+8y = 4+y^2+4y+4 = (y+2)^2$$

$$(y+2)(y+2) \geq 0 \rightarrow y \geq -2$$

$$(-\infty, -2) \cup [-2, +\infty)$$

$$f(x) = \frac{x^2-x+\frac{1}{x}}{x^2-x+1} \rightarrow D_f = \mathbb{R}$$

مشتق

$$2x^2 \cdot y + x = x^2 - x + \frac{1}{x}$$

$$(2-y)x^2+x(1-y)+y-\frac{1}{x}=0$$

$$x = \frac{2-y \pm \sqrt{-3y^2+3y}}{2(2-y)}$$

$$\Delta = (1-y)^2 - 4(y-\frac{1}{x})(2-y)$$

$$y^2+1-2y-4y^2+4y-1 = -3y^2+3y \geq 0$$

$$3y(-y+1) \geq 0$$

$$\frac{0}{-1+1} \rightarrow \mathbb{R} = [0, 1]$$

$$y = \sqrt{-x^2+4x-1}$$

$$\max \left| \frac{4}{x} \right| = 2 \rightarrow (-\infty, 2] \rightarrow \mathbb{R} = [0, 2]$$

مشتق مثبت

$$\sqrt{2x^2-1x}$$

$$\min \left| \frac{2}{x} \right| = 2 \rightarrow [-2, +\infty)$$

سوال ۲: (۳)

الف) $y = \log(x^3 - x + 1) \rightarrow \mathbb{R} \setminus R_f$

راجع! افقت!

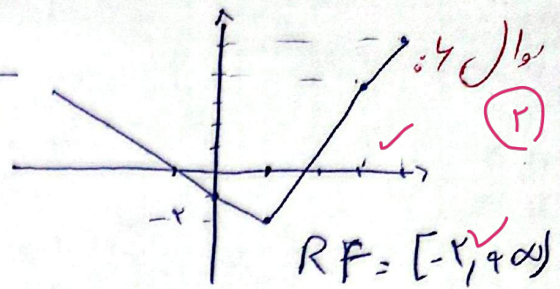
سوال ٧:

(٢)

ب) $y = \log_p \frac{x^2 + 1}{x} \geq 0 \Rightarrow \min_{x \in \mathbb{R}^+} 1 + \frac{1}{x} \geq 2 \rightarrow R_f = [1, +\infty)$

الف) $y = |2x - 2| - |x - 3|$
 $x = 1$ $x = 3$

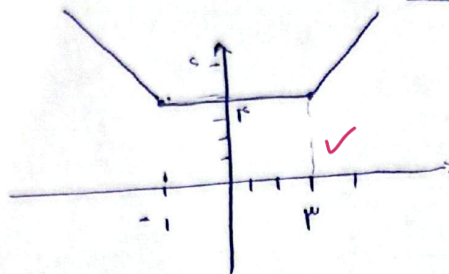
$-x - 1$ $|2x - 4 + x - 3|$ $|x - 3|$



سوال ٤:

(٢)

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



$R_f = [4, +\infty)$

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

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

$x + 2$ $-3x$ $|x - 2 + 2x + 2|$
 $-x - 2$

$-3x \leq 1$ $x + 2 = 1$
 $x \geq -\frac{1}{3}$ $x = -1$

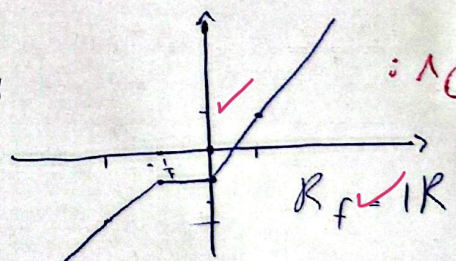
$(-\infty, -1] \cup [-\frac{1}{3}, +\infty)$

سوال ٧:

(٢)

$y = 3x - |2x + 1| + |x|$
 $x = -\frac{1}{2}$ $x = 0$

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

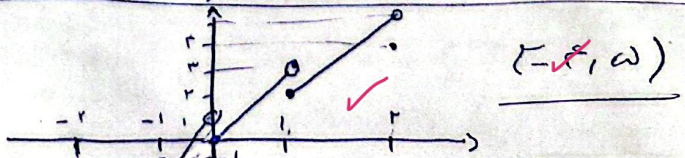
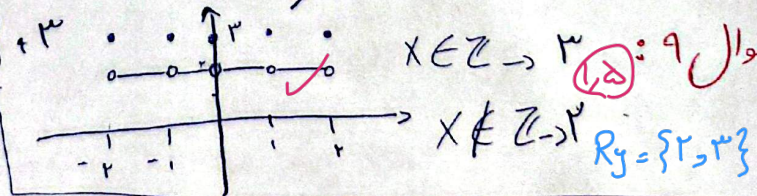


سوال ٨:

(٢)

$y = [x] + [3 - x] \rightarrow [x] + [-x] + 3$
 $x \in \mathbb{Z} \rightarrow 3$ $x \notin \mathbb{Z} \rightarrow 2$

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



$y = \sin^2 x - \sin x + 1$
 $x = 1$ $\frac{x}{2} = \frac{1}{2}$
 $\left(\frac{1}{2}\right)^2 + \frac{1}{2} - \frac{1}{2} + 1 = \frac{5}{4}$
 $x = -1$ $\frac{x}{2} = -\frac{1}{2}$
 $\left(-\frac{1}{2}\right)^2 - \frac{1}{2} + 1 = \frac{3}{4}$
 $R = [\frac{3}{4}, \frac{5}{4}]$

$y = \sin^2 x + \sin x + 1$
 $\frac{x}{2} = \frac{1}{2}$ $\frac{x}{2} = -\frac{1}{2}$
 $\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 1 = \frac{9}{4}$
 $\left(-\frac{1}{2}\right)^2 - \frac{1}{2} + 1 = \frac{3}{4}$
 $R = [\frac{3}{4}, \frac{9}{4}] = \mathbb{R}$