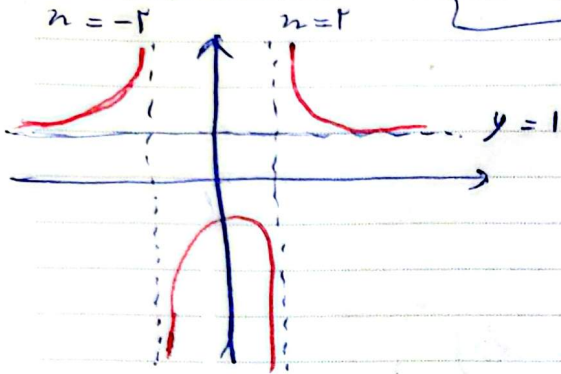


(۱) $y = \frac{|x|+1}{|x|-2} \rightarrow R_y = (-\infty, -\frac{1}{2}] \cup (1, +\infty)$



(۲) $y = \frac{x^2+1}{|x|} = \frac{|x|^2+1}{|x|} = |x| + \frac{1}{|x|}$ $R_y = [2, +\infty)$

$a + \frac{1}{a} \geq 2$

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

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

$4 + y^2 - 4y + 8 + 8y \geq 0 \rightarrow y^2 + 4y + 12 \geq 0$

$y^2 + 4y + 12 = 0 \rightarrow (y+2)(y+6) = 0 \rightarrow y = -2$
 $y = -6$

$\begin{array}{c} -6 \quad -2 \\ + \quad - \quad + \end{array}$

$R_y = (-\infty, -6] \cup [-2, +\infty)$

$f(x) = \frac{x^2-x+\frac{1}{2}}{x^2-x+1} = \frac{(x-\frac{1}{2})^2}{\frac{x^2-x+\frac{1}{2}}{(x-\frac{1}{2})^2} + \frac{5}{2}}$

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

مخرج همواره مثبت در $\mathbb{R}$

دافعه؟

$f(x) = \frac{t}{t + \frac{5}{2}}$ $yt + \frac{5}{2}y = t \rightarrow yt - t = -\frac{5}{2}y$

$t(y-1) = -\frac{5}{2}y \rightarrow t = \frac{-\frac{5}{2}y}{y-1}$

$t \geq 0$

$\frac{-\frac{5}{2}y}{y-1} \geq 0$

$\frac{0}{-1} + \frac{1}{\frac{1}{2}} = -1 + 2 = 1$

$R_f = [0, 1]$

M		4	11	18	25
T		5	12	19	26
W		6	13	20	27
T		7	14	21	28
F	1	8	15	22	29
S	2	9	16	23	30
S	3	10	17	24	31

الف) $y = \sqrt{-x^2 + 8x + 1}$

max | 2
3

$R_y = \sqrt{(-\infty, 3]} \rightarrow R_y = [0, \sqrt{3}]$ ✓

ب) $y = \sqrt[3]{x^2 - 1}$

min | 2
-1

$R_y = \sqrt[3]{[-1, +\infty)} \rightarrow R_y = [-1, +\infty)$ ✓

الف) $y = \log x^2 - 1 + 1$

$R_y = \mathbb{R}$ ✓

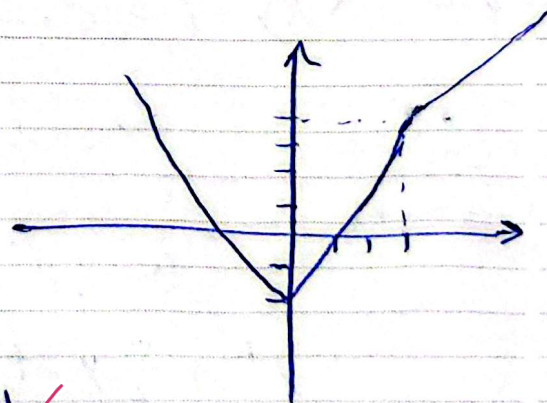
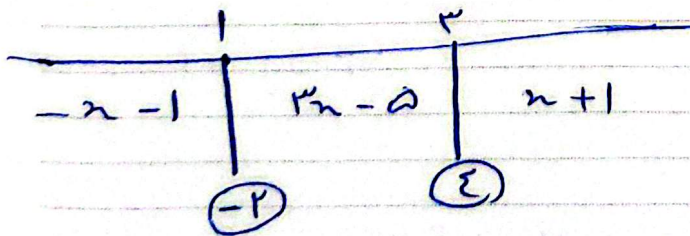
ب) $y = \log_r \frac{x^2 + 1}{x}$

$\frac{x^2 + 1}{x} = x + \frac{1}{x} \rightarrow [1, +\infty)$

~~$R_y = [1, +\infty)$~~

$R_y = [1, +\infty)$ ✓

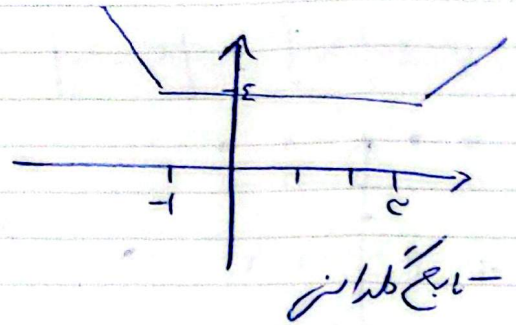
الف) $y = |x - 1| - |x - 2|$



$R_y = [-1, +\infty)$ ✓

۲۵	۱۸	۱۱	۴	۳
۲۶	۱۹	۱۲	۵	۴
۲۷	۲۰	۱۳	۶	۵
۲۸	۲۱	۱۴	۷	۶
۲۹	۲۲	۱۵	۸	۷
۳۰	۲۳	۱۶	۹	۸
۳۱	۲۴	۱۷	۱۰	۹

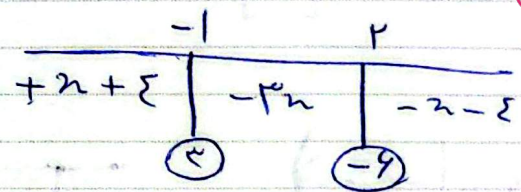
$$1) y = |x-2| + |x+1|$$



$$R_y = [\varepsilon, +\infty)$$

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

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



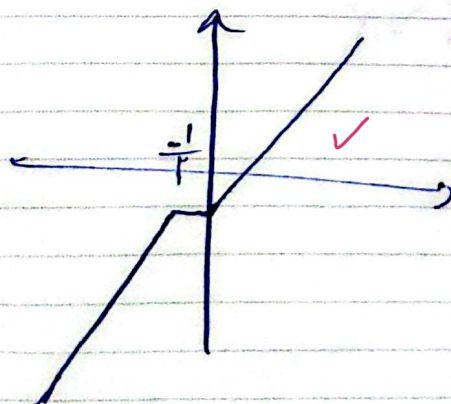
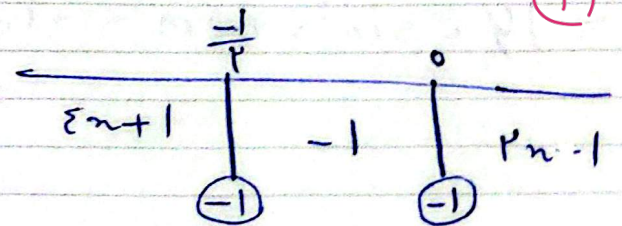
$$x \geq 2 \rightarrow -x - \varepsilon \leq 1 \rightarrow x \geq -1 \rightarrow [2, +\infty) \text{ ①}$$

$$-1 \leq x \leq 2 \rightarrow -2x \leq 1 \rightarrow x \geq -\frac{1}{2} \rightarrow x \in [-\frac{1}{2}, 2] \text{ ②}$$

$$x \leq -1 \rightarrow x + \varepsilon \leq 1 \rightarrow x \leq -\varepsilon \rightarrow x \in (-\infty, -\varepsilon) \text{ ③}$$

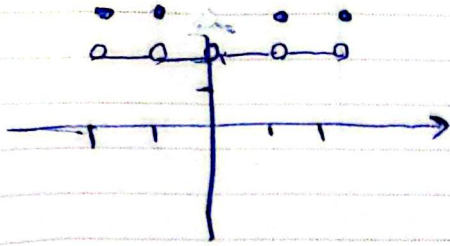
$$\text{①} \cap \text{②} \cap \text{③} = (-\infty, -\varepsilon] \cup [-\frac{1}{2}, +\infty) \checkmark$$

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



$$R_y = \mathbb{R} \checkmark$$

الف) $y = [n] + [3-n] = [n] + [-n] + 3$

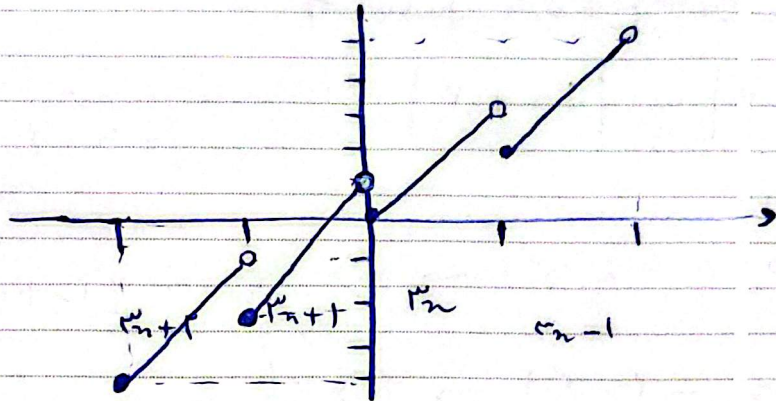


$R_y = \{1, 3\}$

9
2

ب) $y = 3n - [n]$

$R_y = [-1, 2]$



الف) $y = \sin^2 n - \sin n + 1$

$\frac{dy}{dn} = \frac{1}{p} \rightarrow \frac{p}{\epsilon}$

$R_y = [\frac{\epsilon}{\epsilon}, 3]$

10
2

ب) $y = \sin^2 n + \sin^2 n + 1$

$\frac{dy}{dn} = \frac{1}{p} \rightarrow \frac{p}{\epsilon}$

$R_y = [1, 3]$

٢٥	١٨	١١	٤	٥
٢٦	١٩	١٢	٥	٥
٢٧	٢٠	١٣	٦	٥
٢٨	٢١	١٤	٧	٥
٢٩	٢٢	١٥	٨	٦
٣٠	٢٣	١٦	٩	٦
٣١	٢٤	١٧	١٠	٦