

$$f(-x) - af(x) = 2|x| + 1 \quad (1)$$

$$\xrightarrow{x} f(-x) - af(x) = 2|x| + 1 \xrightarrow{x} af(-x) - a^2 f(x) = 2|x| + 1$$

$$\xrightarrow{-x} f(x) + af(-x) = 2|x| + 1$$

$$\xrightarrow{+} (1+a^2)f(x) = (2|x|+1)(1-a) \Rightarrow f(x) = \frac{(2|x|+1)(1-a)}{1+a^2} \quad (2)$$

$$f(x) + f(0) = x^2 - 4x + 3 \xrightarrow{x=0} 2f(0) = 3 \Rightarrow f(0) = \frac{3}{2}$$

$$f(x) = x^2 - 4x + 3 \xrightarrow{x=x^2} x^2 - 4x^2 + 3$$

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

$$(1-y)^2 - 4(y+1) = 0 \Rightarrow (y-5)(y+1) = 0$$

$$\frac{-1}{+} \quad \frac{5}{-} \quad \frac{1}{+} \quad (-\infty, -1] \cup [5, +\infty)$$

$$(الف) 2x^2 \leq ax + 1 \quad \frac{-b}{2a} = \frac{a}{4} \xrightarrow{x=\frac{a}{4}} \frac{-1}{4}$$

$$2\left(\frac{a}{4}\right)^2 - a\left(\frac{a}{4}\right) + 1 = \frac{2a^2}{16} - \frac{a^2}{4} + \frac{1}{1} =$$

$$R = \left[-\frac{1}{4}, +\infty\right)$$

$$ب) y = \sqrt{-x^2 + 4x - 2} \quad \frac{-b}{2a} = 2 \quad y = \sqrt{(-\infty, 2]} \rightarrow [0, 2]$$

$$ج) y = \sqrt{x^4 - 3x^2 + 5x + 1} \rightarrow R = [0, +\infty)$$

$$د) y = \log(x^4 - 3x^2 + 5x + 1)$$

$$x^4 - 3x^2 + 5x + 1 > 0 \quad R = \mathbb{R}$$

② a) $y = \frac{rx+1}{x-1} \quad |R - \{\frac{1}{r}\}$

→ $y = \frac{rx+1}{x-1} \rightarrow \sqrt{R - \{1\}} \rightarrow [0, +\infty) - \{1\}$

b) $y = \frac{x^2+r}{\sqrt{x^2+r}} = \frac{x^2+r+1}{\sqrt{x^2+r}} = \frac{x^2+r}{\sqrt{x^2+r}} + \frac{1}{\sqrt{x^2+r}} = \sqrt{x^2+r} + \frac{1}{\sqrt{x^2+r}}$

$R \equiv [\sqrt{r} + \frac{1}{\sqrt{r}}, +\infty)$

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

④

$y = \frac{rx^2+r}{x^2-1} \rightarrow yx^2 - y = rx^2 + r$

⑤

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

$R = (-\infty, -r) \cup (r, +\infty)$

⑥ $x_{\max} = \infty \rightarrow y = r \quad x_{\min} = 0 \rightarrow y = -r$

$R = (-\infty, -r) \cup (r, +\infty)$

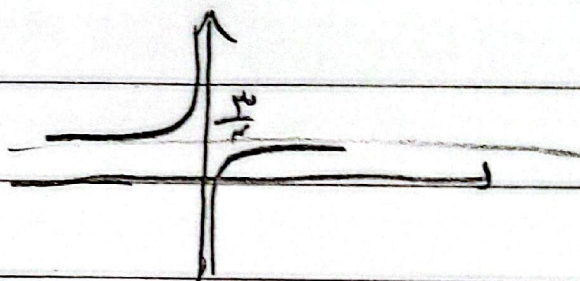
⑦ $f(x) = \frac{r \sin x + r}{\sin x - r}$

$\max \rightarrow \frac{r}{-r} = -1$

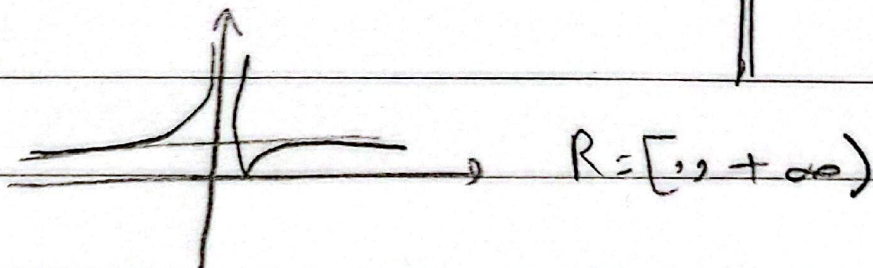
$\min \rightarrow \frac{r}{-r} = -1$

$R = [-r, -\frac{1}{r}]$

① $y = \left| \frac{x^2 - 1}{x^2} \right|$ جانب ائقی = $\frac{3}{4}$
جانب عروقی = 0



||



$R = [0, +\infty)$

١) $y = \sqrt{\frac{9x - 11}{-1 + 2x}}$ جانب ائقی $\sqrt{\frac{9}{2}} \rightarrow \frac{3}{\sqrt{2}}$ $R = \left\{ \frac{11}{9} \right\}$

⑨ $y = 2|x| - 2x$

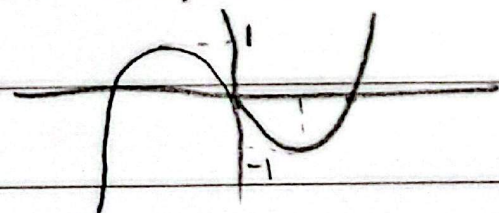
$x < 0$ $0 < x < 2$ $x > 2$

$-x^2 - 2x$

$x^2 - 2x$

$x^2 - 2x$

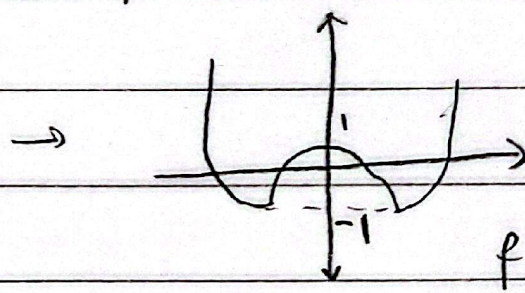
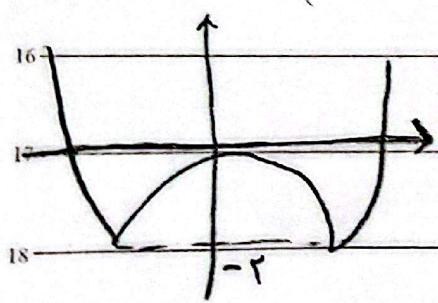
$\frac{-2}{-1+2}$



$\begin{cases} x^2 - 2x & x > 0 \\ -x^2 - 2x & x < 0 \end{cases}$

$R = \mathbb{R}$

⑩ $y = |f(|x|) + 1|$



$f(|x|) + 1$

