

۱- الف) $y = x^2 - 5 \Rightarrow x = \pm \sqrt{y+5}$ $y+5 \geq 0$ $[-5, +\infty)$ ۲ IR

ب) $y = x^3 + 1 \Rightarrow x = \sqrt[3]{y-1}$ $y-1 \in \mathbb{R} \Rightarrow (-\infty, +\infty)$ ۲

۲- الف) $y = x^2 - 4x + 4 \Rightarrow y = (x-2)^2 + 2$ $y-2 = (x-2)^2$ $y-2 \geq 0$ $[2, +\infty)$ ۲

ب) $y = x^2 - 5x + 1 \Rightarrow y = (x - \frac{5}{2})^2 - \frac{21}{4}$ $y + \frac{21}{4} = (x - \frac{5}{2})^2$ $y + \frac{21}{4} \geq 0$ $[-\frac{21}{4}, +\infty)$ ۲

۳- الف) $y = \frac{x^2+3}{x^2-2} \Rightarrow y(x^2-2) = x^2+3$ $yx^2 - 4y = x^2+3$ $yx^2 - x^2 = 4y+3$ $x^2(y-1) = 4y+3$ $x^2 = \frac{4y+3}{y-1}$ $y \neq 1$ $y-1=0$ $y=1$ $y = -\frac{3}{4}$ $y \neq 1$ $y-1=0$ $(-\infty, -\frac{3}{4}] \cup (1, +\infty)$ ۲

ب) $y = \frac{2|x|+1}{|x|-4} \Rightarrow |x|=t \Rightarrow t \geq 0$ $y(t-4) = 2t+1$ $yt - 4y = 2t+1$ $yt - 2t = 4y+1$ $t(y-2) = 4y+1$ $t = \frac{4y+1}{y-2}$ $t = |x|$ $4y+1=0$ $y = -\frac{1}{4}$ $y-2=0$ $y=2$ $(-\infty, -\frac{1}{4}] \cup (2, +\infty)$ ۲

۴- $y = \frac{1}{x^2-4x} = y \Rightarrow (x^2-4x) = \frac{1}{y}$ $yx^2 - 4yx = 1$ $yx^2 - 4yx - 1 = 0$ $\Delta = b^2 - 4ac$ $\Delta = (-4y)^2 - 4(y)(-1) = 16y^2 + 4y$ $\Delta = 4y(4y+1) \geq 0$ $y(4y+1) \geq 0$ $y \leq -\frac{1}{4}$ $y \geq 0$ $(-\infty, -\frac{1}{4}] \cup (0, +\infty)$ ۲

۵- الف) $y = x^2 - 6x + 2 = y \Rightarrow (x-3)^2 = y+7$ $y_{min} = -7$ $[-7, +\infty)$ ۲

ب) $y = -x^2 + 4x + 2 = y \Rightarrow -(x^2 - 4x + 4) + 4 + 2 = y$ $y_{max} = 6$ $(-\infty, 6]$ ۲

۶- الف) $y = \sqrt{x^2 - 6x + 2} = y(x) = x^2 - 6x + 2$ $y(x) = (x-3)^2 - 7$ $y_{min} = -7$ $[-7, +\infty)$ ۲

ب) $y = \sqrt{-x^2 + 4x + 10} = y(x) = -x^2 + 4x + 10$ $y(x) = -(x^2 - 4x) + 10$ $y(x) = -(x-2)^2 + 14$ $y_{max} = 14$ $(-\infty, 14]$ ۲

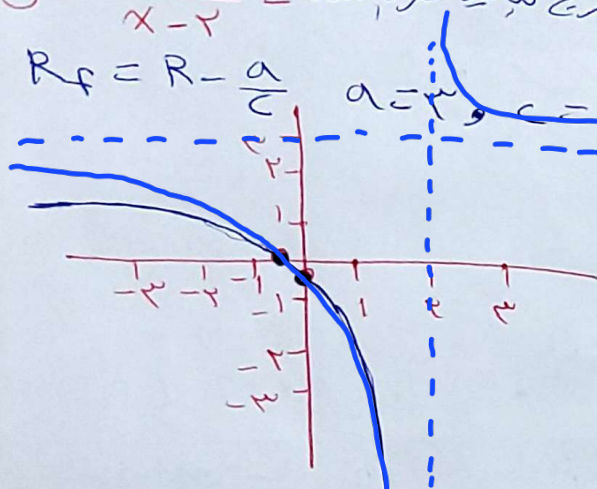
7- الف) طبق نکته 6، درجه 7 به ازاء $\mathbb{R}$ است به ترتیب $(-\infty, +\infty)$ $y = x^7 + 4x^4 + 2x + 1$

$y = \sqrt{x^6 + 6x^2 + 5x + 1} = y(x) \in \mathbb{R}$ (مردود و گسسته) است
 $y \in (-\infty, +\infty)$ $y = \sqrt{y(x)} \geq 0$ $y_{\min} = 0$ $[0, +\infty)$

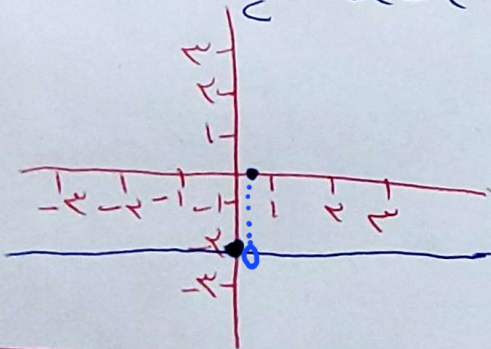
$y = \frac{3x+1}{x-2} = a = 3, c = 1 \Rightarrow R_f = R - \frac{3}{1} = (R - \{3\})$

$$y = \sqrt{\frac{ex+1}{x+1}} = a = r, c = 1 \quad R - \frac{r}{1} = R - r \quad \frac{ex+1}{x+1} \geq 0 \quad \mathbb{R} = [0, +\infty) - \{r\}$$

$y = \frac{x+1}{x-2} = \text{دستار مخرج نباید صفر شود}$ $x-2 \neq 0$ $x \neq 2$
 $R_f = R - a$ $a = \dots$



$y = \frac{x-2}{1-x}$ تباید مخرج صفر نباشد $1-x \neq 0 \Rightarrow x \neq 1$



$$y = \cos^2 x + \frac{1}{\cos^2 x} = a = \cos^2 x \quad -1 \leq \cos x \leq 1$$

$y = a + \frac{1}{a} > 2$ $y_{\min} = 1 + \frac{1}{1} = 2$ $y \rightarrow +\infty$ $R_f = [2, +\infty)$

$$b = x + \frac{1}{x} \geq y \quad (x > 0) \quad y \geq \sqrt{y} \quad \mathbb{R}_+ = [\sqrt{y}, +\infty)$$

$$a + \frac{1}{a} \rightsquigarrow \mathbb{R}_\neq = (-\infty, \sqrt{-y}] \cup [\sqrt{y}, +\infty)$$