

$$2x^2 - 4x + y^2 + 4y + 1 = k$$

$$2x^2 - 4x = 2(x^2 - 2x) = 2[(x-1)^2 - 1] = 2(x-1)^2 - 2$$

$$y^2 + 4y = (y+2)^2 - 4$$

$$2(x-1)^2 - 2 + (y+2)^2 - 4 + k = 2(x-1)^2 + (y+2)^2 + (k-11)$$

$$k = 11 \quad \checkmark$$

$$a^2 + 4a = 2a + 2 \rightarrow a^2 + a - 2 = 0 \quad \begin{cases} a = -2 \times \\ a = 1 \checkmark \end{cases}$$

$$f(1) = 1 + 1 = 2 \quad \checkmark$$

مع در شرط اول طبق قیاس در شرط دوم $x = -3$ تعیین

$$f(x) = \begin{cases} 2x^2 - b & |x+1| \geq 2 \\ a + 2x & -2 \leq x \leq -1 \end{cases}$$

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$$18 - b = a - 6 \rightarrow a + b = 24 \quad \checkmark$$

$$4x - a \geq 0 \rightarrow 4x \geq a \rightarrow x \geq \frac{a}{4} \rightarrow \frac{a}{4} = 2 \rightarrow a = 8$$

$$b - 2x \geq 0 \rightarrow b \geq 2x \rightarrow \frac{b}{2} \geq x \rightarrow \frac{b}{2} = 2 \rightarrow b = 4$$

$$\frac{b}{a} = \frac{4}{8} = \frac{1}{2} \quad \checkmark$$

الف) $\frac{x+1}{|x-2|} \geq 0$

-	+	+
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$x \geq -1 \cap x \leq 2 \rightarrow -1 \leq x \leq 2$

ب) $[x] - 4 \geq 0 \rightarrow [x] \geq 4 \rightarrow x \geq 4$

$2 - [x] \geq 0 \rightarrow 2 \geq [x] \rightarrow 2 \geq x$

$\cap \rightarrow 2 \leq x \leq 4$

$$x < 3$$

الف) $\frac{x^2 - x - 7}{x^2 - 12x^2 + 3x} \geq 0 \rightarrow (x^2 - 9)(x^2 - 4)$

Sign chart: $\begin{array}{c|cccccc} & - & - & - & + & + \\ \hline & + & - & - & + & + \end{array}$

Solution: $(2, +\infty) \cup (-\infty, -2) - \{3\}$

الف) $\frac{x^2 - 2x^2 - 2x + 7}{x^2 - x + 7} \geq 0$

Sign chart: $\begin{array}{c|cccccc} & - & - & - & + & + \\ \hline & + & - & - & + & + \end{array}$

Solution: $(2, +\infty) \cup [1, 2) \cup (-2, -1) \cup (-\infty, -2)$

الف) $[-x] - 2 \geq 0 \rightarrow [-x] \geq 2 \rightarrow (-\infty, -2]$

ب) $\frac{2x^2 + 7}{(x^2 - 2x) - 2} \geq 0 \rightarrow R = [-1, 0) \cup [2, +\infty)$

الف) $\frac{\cos x + 1}{\sin x} \geq \frac{\sin x}{\cos x + 1}$

Conditions: $\begin{cases} \tan x \neq -1 \\ \sin x \neq 0 \\ \cos x \neq 0 \end{cases}$

Solution: $R = \{2k\pi + \frac{\pi}{2}, 2k\pi + \frac{3\pi}{2}, k\pi, 2k\pi + \pi\}$

Unit circle diagram showing points at $\frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$.

ب) $1 - \sin^2 x \geq 0 \rightarrow \frac{1}{2} \geq \sin^2 x \rightarrow \frac{1}{2} \geq \sin x$

Sign chart: $\begin{array}{c|cccc} & + & - & - & + \\ \hline & + & - & - & + \end{array}$

Solution: $D = [k\pi - \frac{\pi}{4}, k\pi + \frac{\pi}{4}]$

الف) $1 - \log \frac{1}{x} \geq 0 \rightarrow 1 \geq \log \frac{1}{x} \rightarrow x > 1$

Sign chart: $\begin{array}{c|cccc} & + & - & - & + \\ \hline & + & - & - & + \end{array}$

Solution: $[1, +\infty) \cup (-\infty, 0)$

ب) $x^2 - x \geq 0 \rightarrow x(x - 1) \geq 0$

Sign chart: $\begin{array}{c|cccc} & + & - & - & + \\ \hline & + & - & - & + \end{array}$

Solution: $D = (-\infty, 0) \cup (1, +\infty)$

ب) $\frac{rx + a}{rx + b} \in W$

Equation: $rxw + bw = rx + a \rightarrow rx - rxw = a - bw$

Solution: $\{x | x = \frac{a - bw}{r - rw}, k \in W\}$