

$$\begin{aligned} y^3 - x &= 2x^2 \\ y^3 &= 2x^2 + x \\ y^3 &= 2x^2 + x \end{aligned} \quad \left. \begin{aligned} y^3 &= y^3 \Rightarrow y_1 = y_2 \\ y^3 &= 2x^2 + x \end{aligned} \right\} \text{تابع است}$$

$$\begin{aligned} |y| + x^2 &= x + 3 \\ |y_1| &= x^2 + 3 - x^2 \\ |y_2| &= x^2 + 3 - x^2 \end{aligned} \quad \left. \begin{aligned} |y_1| &= |y_2| \Rightarrow \\ |y_1| &= x^2 + 3 - x^2 \end{aligned} \right\} \text{تابع است}$$

$$\begin{aligned} \sqrt{x-4} + |y-2| &= 0 \\ \text{فقط یک زوج مرتب (0,0) را پوشش می دهد} \\ \text{تابع است چون دو عبارت نامنفی است} \\ x &= \cos y \rightarrow \text{اگر } x=0 \text{ باشد} \\ &\downarrow \\ &= \text{تابع} \end{aligned}$$

$$\begin{aligned} \frac{x+4}{x^2-4x} &= x^2-4x \neq 0 \\ \frac{x^2-4x}{x} &\neq 0 \Rightarrow x(x-4) \neq 0 \\ \text{Df} &\in \mathbb{R} - \{0, 4\} \end{aligned}$$

$$\frac{x+4}{x^2-4x+1} = \text{تابعی نیست زیرا}$$

$$\begin{aligned} \frac{x+4}{x^2+4x} &= \text{تابعی نیست زیرا} \\ \frac{x+4}{x^2-4x} &= (x^2-4x)(x^2+4x) \neq 0 \\ \text{مکان ندارد} \\ \text{Df} &\in \mathbb{R} - \{0, 4\} \end{aligned}$$

$$\begin{aligned} \sqrt{4-x} + \sqrt{x-2} &= \\ 4-x &\geq 0 \quad x \leq 4 \quad (-\infty, 4] \\ x-2 &\geq 0 \quad x \geq 2 \quad [2, +\infty) \end{aligned} \quad \left. \begin{aligned} & \\ & \end{aligned} \right\} [2, 4]$$

$$\frac{3x+1}{x^2+1} = x^2+1 \neq 0 \quad x^2 \neq -1 \quad \checkmark \\ \text{Df} \in \mathbb{R}$$

$$\begin{aligned} \sqrt{x-2} \quad x-2 &\geq 0 \quad x \geq 2 \\ &[2, +\infty) \\ \frac{\sqrt{x-2}}{x-4} &= x-4 \neq 0 \quad x \neq 4 \\ \text{Df} &\in [2, +\infty) - \{4\} \end{aligned}$$

$$\frac{2x+3}{|x|+x^2} = |x|+x^2 \neq 0 \\ |x| \neq -x^2 \quad \checkmark \\ \text{Df} \in \mathbb{R}$$

$$y = |x| + 2$$



$$y = |x+2|$$



$$y = 2|x|$$



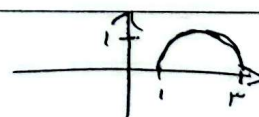
$$y = |x+2| + 2$$



الف)



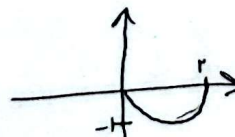
ب)



ج)



د)



(الف)

$$\frac{(x-2)(x-4)(x-6)}{x^2}$$

Number line diagram:

$$-\quad | \quad + \quad | \quad - \quad | \quad +$$

Solution set:

$$[2, 4] \cup [6, +\infty)$$

$$\begin{array}{c} (x-2)(x-3)^2(x-4) \\ \downarrow \quad \downarrow \quad \downarrow \\ 2 \quad 3 \quad 4 \\ \hline + \quad | \quad - \quad | \quad - \quad | \quad + \\ 2 \quad 3 \quad 4 \\ (-\infty, 2] \cup \{3\} \cup [4, +\infty) \end{array}$$

$$\text{ii) } \frac{(x-r)(x-r^*)}{x-r}$$

$\begin{array}{ccccccc} & r & & r^* & & r^* & \\ - & | & + & | & - & | & + \\ & \oplus & & \oplus & & \oplus & \end{array}$

$[r, r^*) \quad [r^*, +\infty)$

$$-) \frac{(x-2)(x-5)}{(x-3)^2}$$

$$\begin{array}{c} 2 \qquad \qquad \qquad 3^* \qquad \qquad \qquad 5 \\ + \quad | \quad - \quad | \quad - \quad | \quad + \\ (-\infty, 2] \qquad \qquad \qquad [3, +\infty) \end{array}$$

$$\text{ii) } \frac{x^3 - 3x + 1}{x - 1} = \frac{(x-1)(x^2 + x - 2)}{(x-1)}$$

$$\frac{1}{-} \begin{array}{c} 1 \\ | \\ \hline 1 \end{array} + \frac{2}{-} \begin{array}{c} 2 \\ | \\ \hline 1 \end{array} = \begin{array}{c} 3 \\ | \\ \hline 1 \end{array} + \infty$$

$$\frac{1}{-} [1, 2] \cup \frac{2}{-} [3, \infty)$$

[illegible]

الف) $\frac{a^4 - a^2}{a^2 + a + 1}$

$\downarrow$

$(a^2 - a)(a^2 + a)$

$D \notin \mathbb{R}$

$$\frac{x^2 + 3x + 2}{x^2 + 2x + 2} = \text{.....}$$

$$\sqrt{\frac{x^3-1}{x^3-x}} = \text{اف}$$

$$\left. \begin{array}{l} \sqrt{x^p - a} \\ x^p - 1 \geq 0 \quad x^p \geq 1 \Rightarrow a \geq 1 \\ x^p - a \neq 0 \quad x^p \neq a \end{array} \right\} \begin{array}{l} [1, +\infty) \\ (-\infty, 0) \end{array}$$

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

$$(-\infty, -\frac{1}{2}] \cup [\frac{1}{2}, 1) \cup (1, \infty)$$

$$D \neq \emptyset$$