

$$y^3 - x = 2x^2$$

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

تابع است ✓

$$|y| + x^2 = x + 3$$

$$\left. \begin{aligned} |y_1| &= x^2 + 3 - x^2 \\ |y_2| &= x^2 + 3 - x^2 \end{aligned} \right\} |y_1| = |y_2| \Rightarrow y_1 = \pm y_2$$

تابع است ✓

$$\sqrt{x-4} + |y-2| = 0$$

فقط یک زوج مرتب (۰, ۰) را پوشش می دهد و تابع است چون دو عبارت نامنفی است ✓

$$x = \cos y \rightarrow \text{اگر } x=0 \text{ باشد}$$

$$-\frac{1}{2} = y \cos$$

تابع است ✓

$$\frac{x+4}{x^2-4x} = x^2-4x \neq 0$$

$$\frac{x^2-4x}{x} \neq 0 \Rightarrow x(x-4) \neq 0$$

DFER - {0, 4} ✓

$$\frac{x+4}{x^2-4x+14} = \text{دلتا منفی ریشه ندارد}$$

تابع است ✓

$$\frac{x+4}{x^2+4x+4} = \text{دلتا منفی ریشه ندارد}$$

تابع است ✓

$$\frac{x+4}{x^2-4x} = (x^2-4x)(x^2+4x) \neq 0$$

DFER - {0, 4} ✓

$$\sqrt{4-x} + \sqrt{x-2} =$$

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

تابع است ✓

$$\frac{\sqrt{x-2}}{x-4} =$$

DFER - {4} ✓

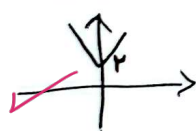
$$\frac{3x+1}{x^2+1} = x^2+1 \neq 0 \Rightarrow x^2 \neq -1$$

DFER ✓

$$\frac{2x+3}{|x|+x^2} =$$

DFER - {0} ✓

$$y = |x| + 2$$



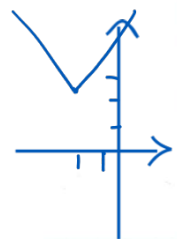
$$y = |x+2|$$



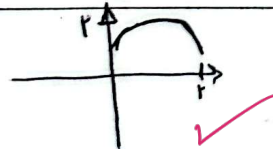
$$y = 2|x|$$



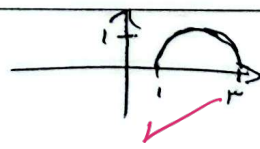
$$y = |x+2| + 2$$



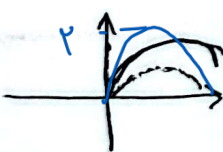
الف)



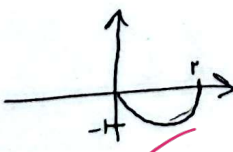
ب)



ج)



د)



الف) $\frac{(x-2)(x-3)(x-4)}{x^2}$

Sign chart: $\frac{-}{+} \frac{+}{-} \frac{-}{+}$ at $x=2, 3, 4$

Intervals: $[2, 3] \cup [4, +\infty)$

ب) $\frac{(x-2)(x-3)^2(x-4)}{x^2}$

Sign chart: $\frac{-}{+} \frac{+}{-} \frac{-}{+}$ at $x=2, 3, 4$

Intervals: $(-\infty, 2] \cup \{3\} \cup [4, +\infty)$

الف) $\frac{(x-2)(x-4)}{x-3}$

Sign chart: $\frac{-}{+} \frac{+}{-} \frac{-}{+}$ at $x=2, 3, 4$

Intervals: $[2, 3) \cup [4, +\infty)$

ب) $\frac{(x-2)(x-4)}{(x-3)^2}$

Sign chart: $\frac{+}{-} \frac{-}{+} \frac{-}{+}$ at $x=2, 3, 4$

Intervals: $(-\infty, 2] \cup [4, +\infty)$

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

ب) $\frac{x^3-3x^2+2}{x^2-4x+3} = \frac{(x-1)(x-2)}{(x-1)(x-3)}$

Sign chart: $\frac{-}{+} \frac{+}{-} \frac{-}{+}$ at $x=1, 2, 3$

Intervals: $[1, 2] \cup [3, +\infty)$

Sign chart: $\frac{+}{-} \frac{-}{+} \frac{+}{-}$ at $x=1, 2, 3$

Intervals: $(-\infty, 1) \cup (1, 2] \cup [3, +\infty)$

الف) $\frac{(x-1)^2(x+2)}{x-3}$

Sign chart: $\frac{+}{-} \frac{+}{-} \frac{+}{-}$ at $x=1, 2, 3$

الف) $\frac{x^4-x^2}{x^2+x+2}$

Factorization: $(x^2-x)(x^2+x)$

Discriminant: $D \notin \mathbb{R}$

ب) $\frac{x^4+3x^2+2}{x^2+2x+3}$

الف) $\frac{x^2(x^2-1)}{x^2+x+2}$

Sign chart: $\frac{+}{-} \frac{-}{+} \frac{+}{-}$ at $x=1, 2, 3$

الف) $\sqrt{\frac{x^3-1}{x^3-x}} = \frac{(x-1)(x^2+x+1)}{x(x-1)(x+1)}$

ب) $\sqrt{\frac{x^2-16}{x^2-4x+4}} = \frac{(x-4)(x+4)}{(x-1)(x-2)}$

Sign chart: $\frac{-}{+} \frac{+}{-} \frac{-}{+}$ at $x=1, 2, 4$

Intervals: $(-\infty, -4] \cup [1, 2) \cup [4, +\infty)$

Sign chart: $\frac{+}{-} \frac{-}{+} \frac{+}{-}$ at $x=1, 2, 4$

Intervals: $(-\infty, -4] \cup [1, 2) \cup [4, +\infty)$

$D \in (-\infty, -1) \cup (0, +\infty) - \{1\}$