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الف) $y^3 - \frac{x}{0} = \frac{2x^2}{0}$ $y_1^3 - x = 2x^2$ $y_1^3 = y_2^3$ $y_1 = y_2 \Rightarrow$ تابع است ✓
 $y_2^3 - x = 2x^2$ $y_1 = y_2$

ب) $|y| + x^2 = x + 3 \Rightarrow |y| = 3 - x^2$ $y = \pm \sqrt{3 - x^2}$ تابع نیست ✓

ج) $\sqrt{x-4} + |y-2| = 0$ $\sqrt{x-4} = 0$ $|y-2| = 0$ $x=4$ $y=2$ تابع نیست ✓
 د) $x = \cos y$ $170^\circ - 90^\circ$ تابع است ✓

الف) $y = \frac{x+2}{x^2-4x} \rightarrow DF = \mathbb{R} - \{0, 4\}$ $x \neq 0, 4$

ب) $y = \frac{x+2}{x(x-4)}$ $DF = \mathbb{R}$ ✓

ج) $x^2 - 4x + 4 \rightarrow \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{4 \pm \sqrt{16 - 16}}{2} = 2$ $y = \frac{x+2}{x^2+x+4}$ $A = b^2 - 4ac$ $DF = \mathbb{R}$ ✓

د) $y = \frac{x+2}{x^2-4x} \rightarrow DF = \mathbb{R} - \{0, 4\}$ $DF = \mathbb{R}$ ✓

الف) $y = \sqrt{4-x} + \sqrt{x-2}$ $x \leq 4$ $x \geq 2$ $DF = [2, 4]$

ب) $y = \frac{3x+1}{x^2+1} \rightarrow DF = \mathbb{R}$ ✓

ج) $y = \frac{2x+3}{|x|+x^2}$ $|x|+x^2 \neq 0$ $|x|+x^2 = 0$ $DF = \mathbb{R} - \{0\}$ $x \neq 0$ ✓

الف) $y = |x| + 2$

ب) $y = 2|x|$

ج) $y = |x+2|$

د) $y = |x+2| + 3$

الف) $f(x) + 1$

ب) $2f(x) =$

ج) $f(x-1) =$

الف) $-f(x)$
 آینه نسبت به محور x
 شکل متعکس است و برعکس

$$y = (x-2)(x-3)(x-4) \quad \text{الف}$$

$$\begin{array}{ccccccc} & 2 & & 3 & & 4 & \\ & + & \phi & + & \phi & - & \phi & + \end{array} \quad \checkmark$$

$$y = (x-2)(x-3)^2(x-4) \quad \text{ب}$$

$$\begin{array}{ccccccc} & 2 & & 3 & & 4 & \\ & + & \phi & - & \phi & - & \phi & + \end{array} \quad \checkmark$$

$$y = \frac{(x-2)(x-4)}{(x-3)} \quad \text{الف}$$

$$\begin{array}{ccccccc} & 2 & & 3 & & 4 & \\ & - & \phi & + & \phi & - & \phi & + \end{array} \quad \checkmark$$

$$y = \frac{(x-2)(x-4)}{(x-3)^2} \quad \text{ب}$$

$$\begin{array}{ccccccc} & 2 & & 3 & & 4 & \\ & + & \phi & - & \phi & - & \phi & + \end{array} \quad \checkmark$$

$$y = \frac{x^3 - 3x + 2}{(x-3)(x-4)} \quad \text{الف}$$

$$\begin{array}{r} x^3 - 3x + 2 : x^2 - 7x + 12 \\ \underline{-(x^3 - 7x^2 + 12x)} \\ 7x^2 - 13x + 2 \\ \underline{-(7x^2 - 49x + 84)} \\ 46x - 82 \\ \underline{-(46x - 322)} \\ 240 \end{array}$$

$$\begin{array}{ccccccc} & 2 & & 3 & & 4 & \\ & + & \phi & - & \phi & - & \phi & + \end{array} \quad \checkmark$$

$$y = \frac{x^2 - 3x + 2}{x^2 - 4x + 12} \quad \text{الف}$$

$$A = \frac{b^2 - 4ac}{4} = \frac{9 - 12}{4} = -\frac{3}{4} < 0$$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-3 \pm \sqrt{9 - 12}}{2} = \frac{-3 \pm \sqrt{-3}}{2}$$

$$y = \frac{x^2 + 3x + 4}{x^2 + 2x + 3} \quad \text{ب}$$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-2 \pm \sqrt{4 - 12}}{2} = \frac{-2 \pm \sqrt{-4}}{2}$$

$$y = \frac{x^2 - 1}{x^2 - x} \quad \text{الف}$$

$$\Delta = b^2 - 4ac = 1 - 4 = -3 < 0$$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-1 \pm \sqrt{-3}}{2}$$

$$y = \sqrt{\frac{x^2 - 14}{x^2 - 5x + 4}} \quad \text{ب}$$

$$\begin{array}{ccccccc} & 2 & & 3 & & 4 & \\ & + & \phi & - & \phi & + & \phi & + \end{array} \quad \checkmark$$