

ب) تابع نیست. $|y| + x^2 = x + 3 \xrightarrow{x=2} |y| + 4 = 2 + 3$
 $\rightarrow |y| = 5 - 4 \rightarrow |y| = 1 \rightarrow y = 1$
 $\rightarrow y = -1$ ✓

الف) تابع است.
 $y^3 - x = 2x^2 \quad y_1^3 = 2x^2 + x$
 $y^3 = 2x^2 + x \quad y_2^3 = 2x^2 + x$
 $y_1^3 = y_2^3 \Rightarrow y_1 = y_2$

ج) تابع است.
 $x = \cos y \xrightarrow{y=0} \cos y = 0$
 $y \rightarrow 90 \rightarrow \frac{\pi}{2}$
 $\rightarrow 270 \rightarrow \frac{3\pi}{2}$ ✓

دومدار (نسبتی) جمع حاصل شود صفر
 $\sqrt{x-4} + |y-2| = 0$
 $\sqrt{x-4} = 0 \quad |y-2| = 0$
 $x = 4 \quad y = 2$ ✓

الف) $x^2 - \sqrt{x} + 14 \neq 0$
 $\Delta = b^2 - 4ac = 49 - 4 \cdot 14 = -15 \Rightarrow \Delta < 0$
 ریشه ندارد ✓

الف) $x^2 - 4x \neq 0$
 $x(x-4) \neq 0$
 $x \neq 0$ ✓

ج) $x^4 - 4x^2 \neq 0$
 $x^2(x^2 - 4) \neq 0$
 $x^2(x+2)(x-2) \neq 0$
 $\mathbb{R} - \{0, -2, 2\}$ ✓

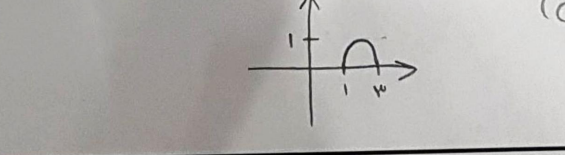
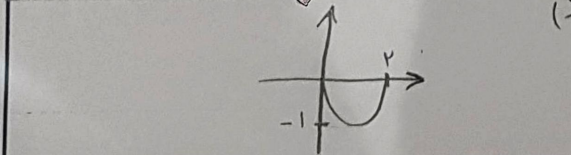
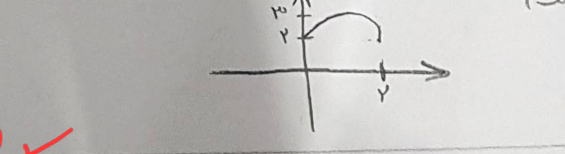
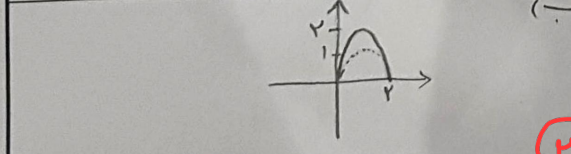
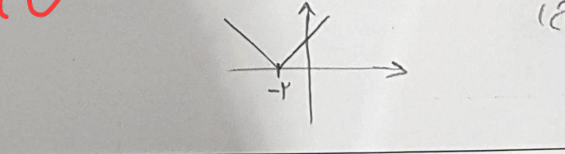
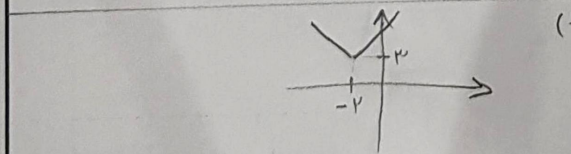
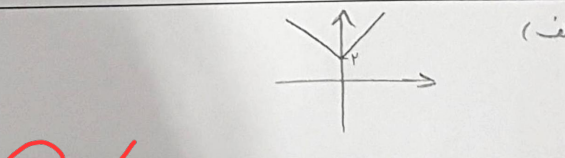
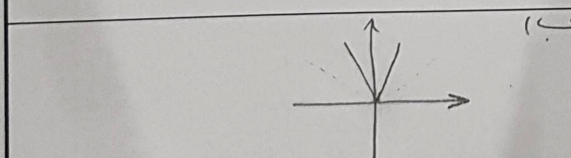
ج) $x^2 + x + 4$
 $\Delta = b^2 - 4ac = 1 - 16 = -15 \Rightarrow \Delta < 0$
 ریشه ندارد ✓

الف) $x^2 + 1 \neq 0$
 $\downarrow \quad \downarrow$
 $\oplus \quad \oplus$ ✓

الف) $\sqrt{4-x} \geq 0 \quad \sqrt{x-2} \geq 0$
 $4-x \geq 0 \quad x-2 \geq 0$
 $4 \geq x \quad x \geq 2$
 $2 \leq x \leq 4$ ✓

ج) $|x| + x^2 \neq 0$
 $\downarrow \quad \downarrow$
 هر دو نامنفی $\Rightarrow x \neq 0$
 $\mathbb{R} - \{0\}$ ✓

ج) $\sqrt{x-2} \geq 0 \quad x-4 \neq 0$
 $x-2 \geq 0 \quad x \neq 4$
 $x \geq 2$
 $[2, 4) \cup (4, +\infty)$ ✓



$\begin{array}{c} \star \\ \hline \begin{array}{ccccc} & 2 & & 3 & & 4 \\ & & & & & \\ + & \circ & - & \circ & - & \circ & + \end{array} \end{array}$ ✓	الف $\begin{array}{c} \hline \begin{array}{ccccc} & 2 & & 3 & & 4 \\ & & & & & \\ - & \circ & + & \circ & - & \circ & + \end{array} \end{array}$ ۶
$\begin{array}{c} \star \\ \hline \begin{array}{ccccc} & 2 & & 3 & & 4 \\ & & & & & \\ + & \circ & - & \circ & - & \circ & + \end{array} \end{array}$ ✓	الف $\begin{array}{c} \hline \begin{array}{ccccc} & 2 & & 3 & & 4 \\ & & & & & \\ - & \circ & + & \circ & - & \circ & + \end{array} \end{array}$ ۷
$\frac{(x-2)(x-1)}{(x-3)(x-1)}$ $\begin{array}{c} \star \\ \hline \begin{array}{ccccc} & 1 & & 2 & & 3 \\ & & & & & \\ + & \circ & + & \circ & - & \circ & + \end{array} \end{array}$ ✓	الف $\begin{aligned} x^3 - 3x + 2 \\ a + b + c = 1 - 3 + 2 = 0 \Rightarrow \\ \begin{array}{r} x^3 - 3x + 2 \quad \quad x - 1 \\ \underline{x^3 - x + 2} \\ - 2x + 2 \\ \underline{-2x + 2} \\ 0 \end{array} \end{aligned}$ $\frac{(x-1)^2(x+2)}{(x-3)}$ $\begin{array}{c} \star \\ \hline \begin{array}{ccccc} & -2 & & 1 & & 3 \\ & & & & & \\ + & \circ & - & \circ & - & \circ & + \end{array} \end{array}$ ۸
ب) هم دمای صورت و هم دمای مخرج منفی است. بنابراین همیشه مثبت ← پس هر دو ریشه ندارند. صورت $\Delta = 9 - 14 = -5$ مخرج $\Delta = 4 - 12 = -8$ ← ریشه ندارند علامت تغییر نمی‌کند $+$ ✓	الف $\begin{aligned} x^2(x^2-1) &\leq 0 \quad x^2(x-1)(x+1) \\ \begin{array}{c} \leq 0 \\ \leq -1 \end{array} \end{aligned}$ $\frac{x^2 + x + 2}{x^2 + x + 2}$ $\begin{array}{c} \star \\ \hline \begin{array}{ccccc} & -1 & & 0 & & 1 \\ & & & & & \\ + & \circ & - & \circ & - & \circ & + \end{array} \end{array}$ $\Delta = 1 - 4 = -3 < 0 \Rightarrow \Delta < 0 \rightarrow$ ریشه ندارند ۹
$\sqrt{\frac{x^2-14}{x^2-5x+4}}$ $\frac{(x-4)(x+4)}{(x-4)(x-1)}$ $\frac{(x-4)(x-1)}{(x-4)(x-1)}$ $\{x \in \mathbb{R} \mid x \in (-4, 1] \cup \{4\}\}$ $\begin{array}{c} \star \\ \hline \begin{array}{ccccc} & -4 & & 1 & & 4 \\ & & & & & \\ + & \circ & - & \circ & + & \circ & + \end{array} \end{array}$ ✓	الف $\sqrt{\frac{x^3-1}{x(x^2-1)}}$ $\frac{x^3-1}{x(x^2-1)}$ $\frac{(x-1)(x^2+x+1)}{x(x-1)(x+1)}$ $\frac{x^2+x+1}{x(x+1)}$ $\frac{(x+1)(x+1)}{x(x+1)}$ $\frac{(x+1)}{x}$ $\frac{(x+1)}{x}$ $\frac{(x+1)}{x}$ ۱۰