

(۱) تابع است. $\checkmark$ $y = x_1 - x_2 \rightarrow y^3 = x_1^3 - x_2^3 \rightarrow x_1^3 - 1 = x_2^3 \rightarrow x_1^3 = x_2^3 + 1$ (الف)
 $\left. \begin{aligned} x_1^3 &= x_2^3 + 1 \\ x_2^3 &= x_1^3 - 1 \end{aligned} \right\} \xrightarrow{x_1 \leq x_2} x_1^3 + x_2^3 = x_1^3 + x_1^3 - 1 = 2x_1^3 - 1$

(ب) $\left. \begin{aligned} x_1^3 &= x_2^3 + 1 \\ x_2^3 &= x_1^3 - 1 \end{aligned} \right\} \xrightarrow{x_1 \leq x_2} x_1^3 + x_2^3 = x_1^3 + x_1^3 - 1 = 2x_1^3 - 1$
 $x_1^3 - x_2^3 = (x_1 - x_2)(x_1^2 + x_1x_2 + x_2^2) = (x_1 - x_2) \Delta < 0$
 $\checkmark$ تابع است

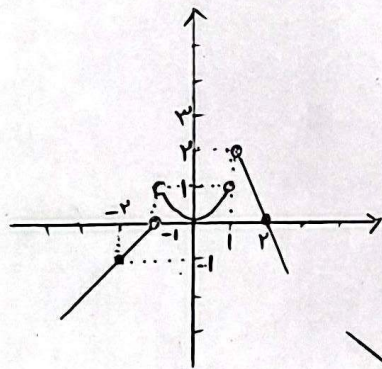
(۲) $x = \pm 1 \rightarrow y = 1 \rightarrow y + 0 = 1 \rightarrow y = 1$ (ب) $x = 0 \rightarrow y = -1$ (الف)
 تابع نیست.

(ج) $\checkmark$ تابع است. $\checkmark$ $y = -1 \rightarrow y^3 = -1 \rightarrow x = 0$ (الف)
 $\left. \begin{aligned} \sqrt[3]{x_1} + \sqrt[3]{x_2} &= 2 \\ \sqrt[3]{y_1} + \sqrt[3]{y_2} &= 2 \end{aligned} \right\} \xrightarrow{x_1 \leq x_2} \sqrt[3]{x_1} = \sqrt[3]{x_2} \rightarrow y_1 = y_2$

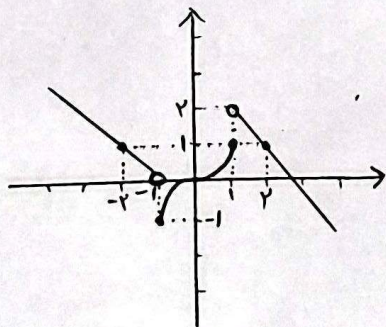
(۳) (الف) $\tan \frac{\pi}{3} = \frac{\sin \frac{\pi}{3}}{\cos \frac{\pi}{3}} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3}$ (ب) $\frac{\cos \frac{7\pi}{6}}{\sin \frac{7\pi}{6}} = \frac{-\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = \sqrt{3}$

(ج) $\frac{\sin 330^\circ}{\cos} = \frac{-\frac{1}{2}}{\frac{\sqrt{3}}{2}} = -\frac{1}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$ (د) $\frac{\cos 180^\circ}{\sin} = \frac{-1}{0}$ تعریف نشده

(۴) (الف) $\sin a = \frac{1}{\sqrt{2}} \rightarrow a = \frac{\pi}{4}, \frac{3\pi}{4}$ (ب) $\cos a = \frac{\sqrt{2}}{2} \rightarrow a = \frac{\pi}{4}, \frac{7\pi}{4}$



$\begin{cases} x=1 \rightarrow 2 & x \leq 2 \rightarrow 0 \\ x^2 - 1 & -1 < x < 1 \\ x=-1 \rightarrow 0 & x \leq -2 \rightarrow -1 \end{cases}$



$\begin{cases} x \leq 1 \rightarrow 2 & x \leq 2 \rightarrow 1 \\ x^3 & -1 \leq x \leq 1 \\ x \leq -1 \rightarrow 0 & x \leq -2 \rightarrow -1 \end{cases}$

(الف) $\text{ریشه ها} = 2, 3, 4$

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

(ب) $\text{ریشه ها} = 2, 3^*, 4$

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

الف) $x^3 - 3 \neq 0$
 $x \neq 3$

تعریف نسبه برای ۳، ۴، ۲ = ریشه ها

$$\begin{array}{ccccccc} & 2 & & 3 & & 4 & \\ & - & 0 & + & 0 & - & 0 & + \\ & & & 0 & & & & \end{array}$$

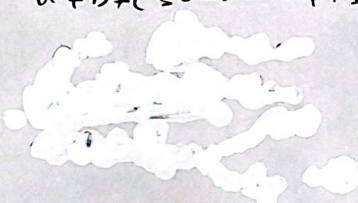
ب) $2, 3, 4$

$$\begin{array}{ccccccc} & 2 & & 3 & & 4 & \\ & + & 0 & - & 0 & - & 0 & + \\ & & & 0 & & & & \end{array}$$

(۱)

$$a+b+c \leq 0 \rightarrow 1-3+2 \leq 0$$

الف) $\frac{x^3 - 3x + 2}{x - 3}$
 (۳)



$$\begin{array}{ccccccc} & 1 & & 2 & & 3 & \\ & - & 0 & + & 0 & - & 0 & + \\ & & & 0 & & & & \end{array}$$

ریشه های
صورت $\leq \frac{c}{a}$ (۲)

(۹)

ب) $\frac{(x-1)(x-2)}{(x-1)(x-3)}$
 ۳

$$\begin{array}{ccccccc} & * & & 1 & & 2 & & 3 \\ & + & 0 & + & 0 & - & 0 & + \\ & & & 0 & & & & 0 & \end{array}$$

الف) $\frac{x^2(x^2-1)}{x^2+x+2}$

$$\begin{array}{ccccccc} & * & & 1 & & - & 1 \\ & - & 1 & & 0 & & 1 \\ & + & 1 & - & 1 & - & 1 & + \end{array}$$

(۱)

ب) $\frac{x^2 + 3x + 4}{x^2 + 2x + 3} \Delta < 0$ همیشه مثبت . ریشه ندارد

$x^2 + 2x + 3 \Delta < 0$