

الف) $y^3 = x^3 - 1$ تابع است $\rightarrow$ شکل



یا منحنی مقابل عدد:

ب) $y^3 + y = x^3 - 1$ تابع است $\rightarrow$



الف) $y = x^3 - 1$ تابع است



ب) $|y| + y = x^3 + 1$ تابع نیست $\rightarrow x=0 \Rightarrow |y|=1 \Rightarrow \begin{cases} y=1 \\ y=-1 \end{cases}$

ج) $y^3 + x^3 = x^3 - 1$ تابع است $\rightarrow \begin{cases} y_1^3 + x_1^3 = x_1^3 - 1 \\ y_2^3 + x_2^3 = x_2^3 - 1 \end{cases} \xrightarrow{x_1=x_2} y_1^3 = y_2^3 \Rightarrow y_1 = y_2$

د) $\sqrt[3]{y} + \sqrt[3]{x} = 1$ رساندن به توان ۳ $\rightarrow y + x + 3 = 0 \rightarrow y = -x - 3$ تابع خطی

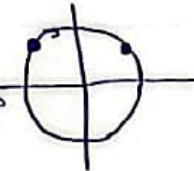
الف) $\tan \frac{\pi}{3} \rightarrow \tan 60^\circ = \frac{\sin 60^\circ}{\cos 60^\circ} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3}$

ب) $\cot \frac{\pi}{4} \rightarrow \cot 45^\circ = \frac{\cos 45^\circ}{\sin 45^\circ} = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 1$

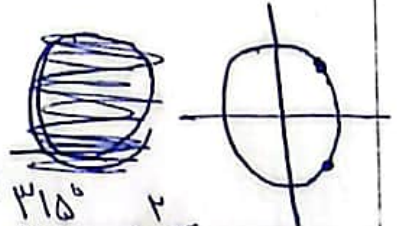
ج) $\tan 330^\circ \rightarrow \frac{\sin 330^\circ}{\cos 330^\circ} = \frac{-\frac{1}{2}}{\frac{\sqrt{3}}{2}} = -\frac{1}{\sqrt{3}}$

د) $\cot 180^\circ \rightarrow \frac{\cos 180^\circ}{\sin 180^\circ} = \frac{-1}{0} = 0$

الف) $\sin \alpha = \frac{1}{4} \rightarrow \alpha = \left\{ \frac{\pi}{4}, \frac{5\pi}{4} \right\} \rightarrow \alpha = 45^\circ, 225^\circ$



ب) $\cos \alpha = \frac{\sqrt{2}}{2} \rightarrow \alpha = \left\{ \frac{\pi}{4}, \frac{7\pi}{4} \right\}$

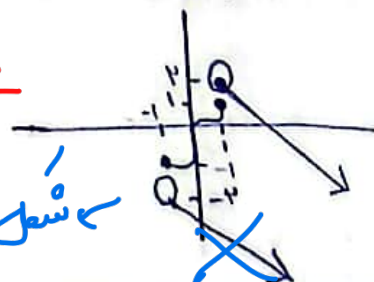
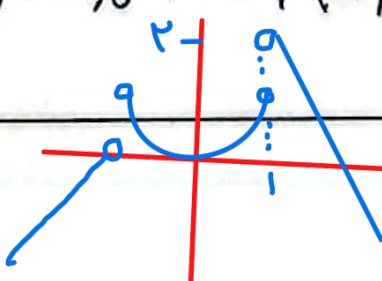


$f(x) = \begin{cases} -x+3 & x > 1 \\ x^3 & -1 \leq x \leq 1 \\ -x-1 & x < -1 \end{cases} \rightarrow f(2) = -2+3=1, f(1) = 1, f(-1) = -1$

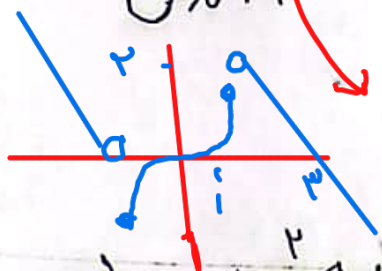
$f(x) = -x-1 \rightarrow f(-1) = -(-1)-1 = 0$

۱.۱۵

شکل خطی



$f(x) = \begin{cases} -x^2 + 1 & x < -1 \\ x & -1 < x < 1 \\ x + 1 & x > 1 \end{cases}$
 $f(x) = -x^2 + \varepsilon \xrightarrow{x=1} f(1) = 2 + \varepsilon$
 $-1 < x < 1 \rightarrow f(x) = x \xrightarrow{x=1} f(1) = 1, f(-1) = -1$
 $x < -1 \rightarrow f(x) = x + 1 \xrightarrow{x=-1} f(-1) = 0$



۱، ۲، ۳

شکل غلط



الف) $y = (x-1)(x-3)(x-5)$

$\begin{array}{ccc} 1 & 3 & 5 \\ - & + & - & + \end{array} \rightarrow D_f = \mathbb{R}$

ب) $y = (x-1)(x-3)^2(x-5)$

$\begin{array}{ccc} 1 & 3 & 5 \\ + & - & + & - & + \end{array} \rightarrow D_f = \mathbb{R}$

الف) $y = \frac{(x-1)(x-5)}{(x-3)}$

$\begin{array}{ccc} 1 & 3 & 5 \\ - & + & - & + \end{array} \rightarrow D_f = \mathbb{R} - \{3\}$

ب) $y = \frac{(x-1)(x-5)}{(x-3)^2}$

$\begin{array}{ccc} 1 & 3 & 5 \\ + & - & + & - & + \end{array} \rightarrow D_f = \mathbb{R} - \{3\}$

الف) $y = \frac{x^2 - 3x + 2}{x - 3}$
 ریشه ندارد

$\begin{array}{c} 3 \\ - & + \end{array} \rightarrow D_f = (3, +\infty)$

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

$\begin{array}{ccc} 1 & 2 & 3 \\ + & - & + & - & + \end{array}$
 $D_f = (3, +\infty) \cup (1, 2] \cup (-\infty, 1)$

الف) $y = \frac{x^2 - x^2}{x^2 + x + 2}$
 ریشه ندارد

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

ب) $\frac{x^2 + 3x + 2}{x^2 + 2x + 3} \neq 0$
 ریشه ندارد

باین صفر

(1)

$\rightarrow D_f = [1, +\infty) \cup (-\infty, 0]$

ب ←

$$y_1^3 + y_1 = 3x_1^2 - 1$$

$$y_2^3 + y_2 = 3x_2^2 - 1$$

$$x_1 = x_2 \rightarrow$$

$$y_1^3 + y_1 = 3x_1^2 - 1$$

$$y_2^3 + y_2 = 3x_2^2 - 1$$

$$\rightarrow y_1^3 + y_1 = y_2^3 + y_2 \rightarrow$$

$$\rightarrow (y_1^3 - y_2^3) + (y_1 - y_2) = 0 \rightarrow (y_1 - y_2)(y_1^2 + y_1 y_2 + y_2^2) + (y_1 - y_2) = 0$$

$$\rightarrow (y_1 - y_2)(y_1^2 + y_1 y_2 + y_2^2 + 1) = 0$$

$$y_1 = y_2 \quad \checkmark \rightarrow \text{تابع است}$$

$$y_1^2 + y_2 y_1 + y_2^2 + 1 = 0 \rightarrow \Delta = (y_2)^2 - 4(y_2^2 + 1) = -3y_2^2 + 4 \rightarrow \Delta < 0$$

✓ ریشه ندارد

$$y^3 = 3x^2 - 1$$

$$y_1^3 = 3x_1^2 - 1$$

$$y_2^3 = 3x_2^2 - 1$$

$$x_1 = x_2 \rightarrow y_1^3 = y_2^3 \rightarrow y_1 = y_2$$

الف ۱ تابع است

۲-د

$$\sqrt[3]{y} + \sqrt[3]{x} = 1$$

تعریف ریاضی

$$\sqrt[3]{y_1} + \sqrt[3]{x_1} = 1$$

$$\sqrt[3]{y_2} + \sqrt[3]{x_2} = 1$$

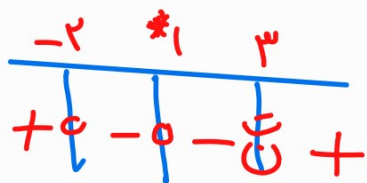
$$x_1 = x_2 = x \rightarrow \sqrt[3]{y_1} + \sqrt[3]{x} = 1$$

$$\sqrt[3]{y_2} + \sqrt[3]{x} = 1$$

$$\rightarrow \sqrt[3]{y_1} = \sqrt[3]{y_2} \rightarrow y_1 = y_2$$

9- الف

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



10- الف

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

