

الف) $y^3 = 2x^2 - 1$ $\begin{cases} y_1^3 = 2x_1^2 - 1 \\ y_2^3 = 2x_2^2 - 1 \end{cases} \xrightarrow{x_1 = x_2} y_1^3 = y_2^3 \rightarrow y_1 = y_2$ (تابع است)

ب) $y^3 + y = 3x^2 - 1$ $\begin{cases} y_1^3 + y_1 = 3x_1^2 - 1 \\ y_2^3 + y_2 = 3x_2^2 - 1 \end{cases} \xrightarrow{x_1 = x_2} y_1^3 + y_1 = y_2^3 + y_2$ $\rightarrow (y_1 - y_2)(y_1^2 + y_1 y_2 + y_2^2 + 1) = 0$ $\rightarrow y_1 = y_2$ (تابع است)

بسیار تغییرات دارد و قابل وفتن

$y_1^3 - y_2^3 + y_1 - y_2 = 0 \rightarrow (y_1 - y_2)(y_1^2 + y_1 y_2 + y_2^2 + 1) = 0$ $\rightarrow y_1 = y_2$ (تابع است)

$y_1^3 + y_1 = y_2^3 + y_2$ $\rightarrow y_1^3 - y_2^3 + y_1 - y_2 = 0$ $\rightarrow (y_1 - y_2)(y_1^2 + y_1 y_2 + y_2^2 + 1) = 0$ $\rightarrow y_1 = y_2$ (تابع است)

الف) $y = x^2 - 1$ $\begin{cases} y_1 = x_1^2 - 1 \\ y_2 = x_2^2 - 1 \end{cases} \xrightarrow{x_1 = x_2} y_1 = y_2$ (تابع است)

ب) $|y| + xy = x^2 + 1$ $\xrightarrow{x=0} |y| = 1 \rightarrow y = \pm 1$ (تابع نیست)

ج) $y^3 + x^3 = 2x - 1$ $\begin{cases} y_1^3 + x_1^3 = 2x_1 - 1 \\ y_2^3 + x_2^3 = 2x_2 - 1 \end{cases} \xrightarrow{x_1 = x_2} y_1^3 = y_2^3 \rightarrow y_1 = y_2$ (تابع است)

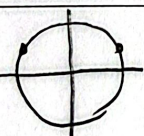
د) $\sqrt[3]{y} + \sqrt{x} = 2$ $\begin{cases} \sqrt[3]{y_1} + \sqrt{x_1} = 2 \\ \sqrt[3]{y_2} + \sqrt{x_2} = 2 \end{cases} \xrightarrow{x_1 = x_2} \sqrt[3]{y_1} = \sqrt[3]{y_2} \rightarrow y_1 = y_2$ (تابع است)

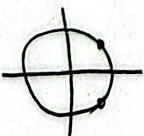
الف) $\tan \frac{\pi}{4} \rightarrow \frac{\sin \frac{\pi}{4}}{\cos \frac{\pi}{4}} = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 1$ (تابع است)

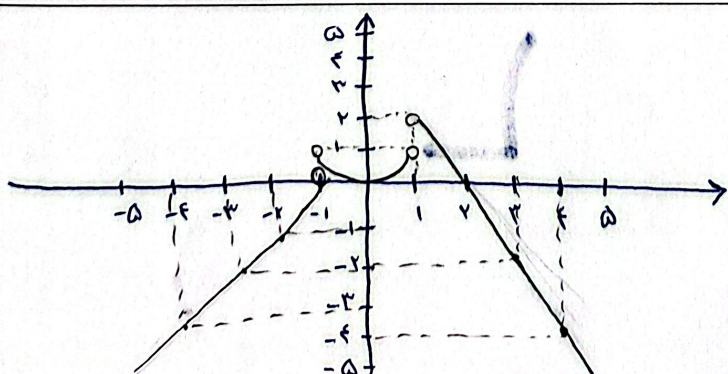
ب) $\cot \frac{5\pi}{4} \rightarrow \frac{\cos \frac{5\pi}{4}}{\sin \frac{5\pi}{4}} = \frac{-\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = 1$ (تابع است)

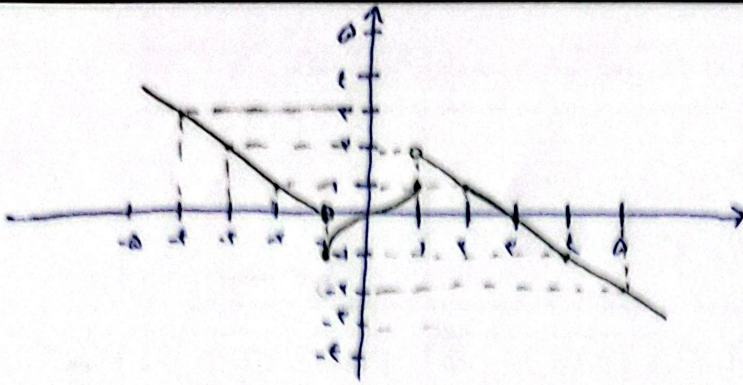
ج) $\tan 33^\circ \rightarrow \frac{\sin 33^\circ}{\cos 33^\circ} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ (تابع است)

د) $\cot 11^\circ \rightarrow \frac{\cos 11^\circ}{\sin 11^\circ} = \frac{1}{0} \rightarrow$ تعریف نشده

الف) $\sin a = \frac{1}{2} \rightarrow$  $= \frac{5\pi}{6}, \frac{\pi}{6}$

ب) $\cos a = \frac{\sqrt{2}}{2} \rightarrow$  $= \frac{5\pi}{4}, \frac{3\pi}{4}$





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الف) $y = (x-2)(x-3)(x-4)$ (شبهه) $\rightarrow$

$$\frac{-\phi \quad + \quad \phi \quad - \quad \phi \quad +}{2 \quad 3 \quad 4}$$

ب) $y = (x-2)(x-3)^2(x-4)$ (شبهه)

$$\frac{+ \phi \quad - \phi^* \quad - \phi \quad +}{2 \quad 3 \quad 4}$$

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الف) $\frac{(x-2)(x-4)}{x-3}$ (شبهه)

$$= 2, 4, 3 \rightarrow \frac{-\phi \quad + \quad \phi \quad - \quad \phi \quad +}{2 \quad 3 \quad 4}$$

ب) $\frac{(x-2)(x-4)}{(x-3)^2}$ (شبهه)

$$= 2, 4, 3^* \rightarrow \frac{+ \phi \quad - \quad \phi^* \quad - \quad \phi \quad +}{2 \quad 3 \quad 4}$$

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

$$= 3, 1^*, -2 \rightarrow \frac{-\phi \quad + \quad \phi \quad - \quad \phi \quad +}{-2 \quad 1 \quad 3}$$

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

$$(شبهه) = 1^*, 3, 2 \rightarrow \frac{+ \phi \quad + \quad \phi \quad - \quad \phi \quad +}{1 \quad 2 \quad 3}$$

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

Δ منفی پس (شبهه) ندارد



$0, 1, -1$

$$\frac{+ \phi \quad - \quad \phi^* \quad - \quad \phi \quad +}{-1 \quad 1 \quad 1}$$

ب) $\frac{x^2+3x+2}{x^2+2x+3} = \rightarrow$ (شبهه) ندارد پس $\mathbb{R}$

$\mathbb{R}$

$$\frac{-\infty}{+} + \infty$$

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