

الف) $y^3 = 2x^2 - 1$
 $y^3 = 2x_1^2 - 1 \rightarrow y_1 = \sqrt[3]{2x_1^2 - 1}$
 $y^3 = 2x_2^2 - 1 \rightarrow y_2 = \sqrt[3]{2x_2^2 - 1}$
 $\left. \begin{matrix} x_1 = x_2 \\ y_1 = y_2 \end{matrix} \right\} \Rightarrow 2x_1^2 = 2x_2^2 \Rightarrow \sqrt[3]{2x_1^2 - 1} = \sqrt[3]{2x_2^2 - 1} \Rightarrow y_1 = y_2 \Rightarrow$ تابع است

ب) $y + y = 2x^2 - 1$
 $y(y+1) = 2x^2 - 1$
 $y_1(y_1+1) = 2x_1^2 - 1$
 $y_2(y_2+1) = 2x_2^2 - 1$
 $\left. \begin{matrix} x_1 = x_2 \\ y_1 = y_2 \end{matrix} \right\} \Rightarrow 2x_1^2 - 1 = 2x_2^2 - 1 \Rightarrow x_1^2 = x_2^2 \Rightarrow x_1 = \pm x_2 \Rightarrow y_1(y_1+1) = y_2(y_2+1)$
 $\Rightarrow y_1 = \pm y_2$ تابع نیست

الف) تابع است $y = x^2 - 1$ (توازن و فرد است)

ب) $|y| + x = x^2 + 1$ if $x=0 \Rightarrow |y| = 1 \Rightarrow y = \pm 1 \Rightarrow x=0 \Rightarrow y = \pm 1$ تابع نیست

ج) $y^3 + x^2 = xy - 1$ if $x=0 \Rightarrow y^3 = -1 \Rightarrow y = -1$ تابع است (توازن و فرد است)

د) $\sqrt[3]{y} + \sqrt[3]{x} = 2$ چون فوجی و علامت تغییر نمی‌کند $\Rightarrow$ تابع است

الف) $\tan \frac{\pi}{4} = \frac{\sin \frac{\pi}{4}}{\cos \frac{\pi}{4}} = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 1$ تعریف نشده

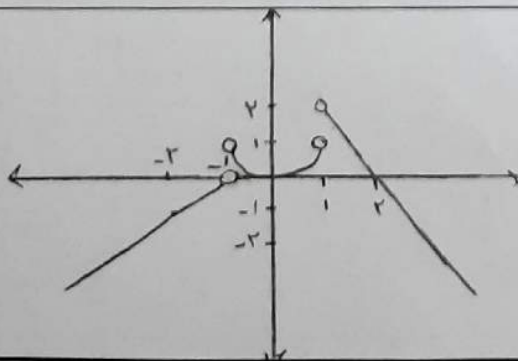
ب) $\cot \frac{\pi}{4} \rightarrow \frac{\cos \frac{\pi}{4}}{\sin \frac{\pi}{4}} = \frac{\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = 1$

ج) $\tan \frac{3\pi}{4} \rightarrow \frac{\sin \frac{3\pi}{4}}{\cos \frac{3\pi}{4}} = \frac{\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = -1$

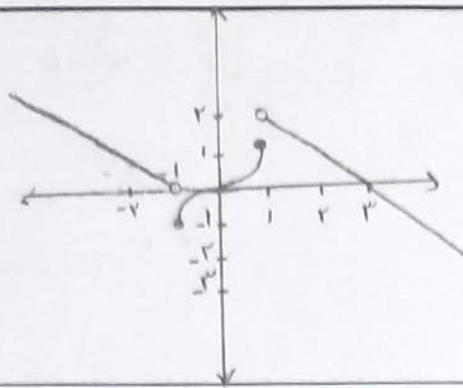
د) $\cot \frac{3\pi}{4} \rightarrow \frac{\cos \frac{3\pi}{4}}{\sin \frac{3\pi}{4}} = \frac{-\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = -1$ چون منور و مغرب است

الف) $\sin \alpha = \frac{1}{2} \Rightarrow \alpha = \left\{ 2k\pi + \frac{\pi}{6}, 2k\pi + \frac{5\pi}{6} \right\}$

ب) $\cos \alpha = \frac{\sqrt{2}}{2} \Rightarrow \alpha = \left\{ 2k\pi + \frac{\pi}{4}, 2k\pi + \frac{7\pi}{4} \right\} \cup \left\{ 2k\pi + \frac{3\pi}{4}, 2k\pi + \frac{5\pi}{4} \right\}$



$$\begin{cases} x > 1 & -2x + 1 \\ -1 < x < 1 & x^2 \\ x < -1 & x + 1 \end{cases}$$



$$\begin{cases} x > 1 & -x + 3 \\ -1 \leq x \leq 1 & x \\ x < -1 & -x - 1 \end{cases}$$

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الف) $y = (x-2)(x-3)(x-4)$

$$\begin{array}{c|ccc} & 2 & 3 & 4 \\ \hline & - & + & - \\ \hline & \phi & + & \phi \end{array} \Rightarrow \begin{cases} y=0: \{2, 3, 4\} \\ y<0: (-\infty, 2) \cup (3, 4) \\ y>0: (2, 3) \cup (4, +\infty) \end{cases}$$

ب) $y = (x-2)(x-3)^2(x-4)$

$$\begin{array}{c|ccc} & 2 & 3 & 4 \\ \hline & + & - & - \\ \hline & \phi & - & \phi \end{array} \Rightarrow \begin{cases} y=0: \{2, 3, 4\} \\ y<0: (2, 3) \cup (3, 4) \\ y>0: (-\infty, 2) \cup (4, +\infty) \end{cases}$$

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الف) $\frac{(x-2)(x-4)}{x-3}$

$$\begin{array}{c|ccc} & 2 & 3 & 4 \\ \hline & - & + & - \\ \hline & \phi & + & \phi \end{array} \Rightarrow \begin{cases} y=0: \{2, 4\} \\ y \rightarrow \infty: \{3\} \\ y<0: (-\infty, 2) \cup (3, 4) \\ y>0: (2, 3) \cup (4, +\infty) \end{cases}$$

تعریف نشده

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ب) $\frac{(x-2)(x-4)}{(x-3)^2}$

$$\begin{array}{c|ccc} & 2 & 3 & 4 \\ \hline & + & - & - \\ \hline & \phi & - & \phi \end{array} \Rightarrow \begin{cases} y=0: \{2, 4\} \\ y \rightarrow \infty: \{3\} \\ y<0: (2, 3) \cup (3, 4) \\ y>0: (-\infty, 2) \cup (4, +\infty) \end{cases}$$

تعریف نشده

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

$$\begin{cases} y=0: \{1, 2\} \\ y<0: (2, 3) \cup (3, +\infty) \\ y>0: (-\infty, 2) \cup (3, +\infty) \end{cases}$$

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

$$\begin{cases} y=0: \{2\} \\ y<0: (2, 3) \\ y>0: (-\infty, 1) \cup (1, 2) \cup (3, +\infty) \end{cases}$$

$$\begin{array}{c|ccc} & -2 & *1 & 3 \\ \hline & + & - & - \\ \hline & \phi & - & \phi \end{array} \Rightarrow \begin{cases} y=0: \{2\} \\ y<0: (2, 3) \\ y>0: (-\infty, 1) \cup (1, 2) \cup (3, +\infty) \end{cases}$$

تعریف نشده

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

	-1	*0	+1
$x^2 - x^2$	+	-	-
$x^2 + x + 2$	+	+	+
حاصل	+	-	+

ب) $\frac{x^2 + 3x + 4}{x^2 + 2x + 3}$

$x^2 + 3x + 4$	+
$x^2 + 2x + 3$	+
حاصل	+

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