

الف) $y^3 = x^2 - 1$
 تعریف $\rightarrow \begin{cases} \text{if } (x_1, y_1) \in f \\ \text{if } (x_2, y_2) \in f \end{cases} \xrightarrow{x_1=x_2} y_1=y_2$
 $y_1^3 = x_1^2 - 1$
 $y_2^3 = x_2^2 - 1$
 $y_1^3 = y_2^3 \rightarrow y_1 = y_2$ تابع هست

ب) $y^3 + y = x^2 - 1$
 تعریف $\begin{cases} \text{if } (x_1, y_1) \in f \\ \text{if } (x_2, y_2) \in f \end{cases} \xrightarrow{x_1=x_2} y_1=y_2$
 $y_1^3 + y_1 = x_1^2 - 1$
 $y_2^3 + y_2 = x_2^2 - 1$
 $y_1^3 + y_1 = y_2^3 + y_2$
 $y_1^3 - y_2^3 + y_1 - y_2 = 0 \rightarrow (y_1 - y_2)(y_1^2 + y_1 y_2 + y_2^2 + 1) = 0$
 $y_1 = y_2$ تابع هست

ج) $y^3 + x^3 = x^2 - 1$
 تعریف $\begin{cases} \text{if } (x_1, y_1) \in f \\ \text{if } (x_2, y_2) \in f \end{cases} \xrightarrow{x_1=x_2} y_1=y_2$
 $y_1^3 + x_1^3 = x_1^2 - 1$
 $y_2^3 + x_2^3 = x_2^2 - 1$
 $y_1^3 + x_1^3 = y_2^3 + x_2^3$
 $y_1^3 - y_2^3 + x_1^3 - x_2^3 = 0$
 $(y_1 - y_2)(y_1^2 + y_1 y_2 + y_2^2 + x_1^2 + x_1 x_2 + x_2^2 + 1) = 0$
 $y_1 = y_2$ تابع هست

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

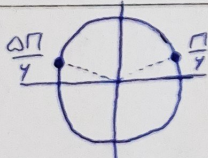
ج) $\sqrt[3]{y} + \sqrt[3]{x} = 2$
 تعریف $\begin{cases} \text{if } (x_1, y_1) \in f \\ \text{if } (x_2, y_2) \in f \end{cases} \xrightarrow{x_1=x_2} y_1=y_2$
 $\sqrt[3]{y_1} + \sqrt[3]{x_1} = 2$
 $\sqrt[3]{y_2} + \sqrt[3]{x_2} = 2$
 $\sqrt[3]{y_1} + \sqrt[3]{x_1} = \sqrt[3]{y_2} + \sqrt[3]{x_2}$
 $\sqrt[3]{y_1} - \sqrt[3]{y_2} + \sqrt[3]{x_1} - \sqrt[3]{x_2} = 0$
 $\sqrt[3]{y_1} = \sqrt[3]{y_2} \rightarrow y_1 = y_2$ تابع هست

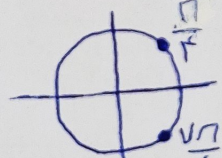
الف) $\tan \frac{\pi}{3} \rightarrow \frac{\sin \frac{\pi}{3}}{\cos \frac{\pi}{3}} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3}$
 $\frac{\pi}{3} \rightarrow \frac{1}{\sqrt{3}}$

ج) $\tan 135^\circ \rightarrow \frac{\sin 135^\circ}{\cos 135^\circ} = \frac{\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = -1$
 $135^\circ \rightarrow \frac{\sqrt{2}}{1}$

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

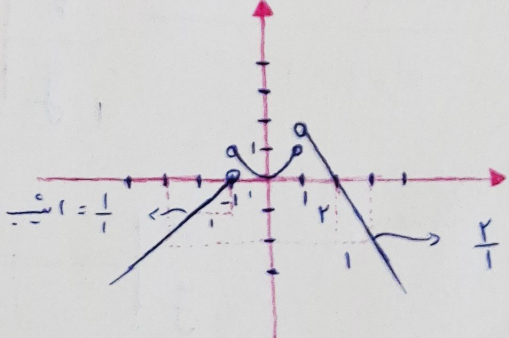
د) $\cot 180^\circ \rightarrow \frac{\cos 180^\circ}{\sin 180^\circ} = \frac{-1}{0}$ (نشد)

الف) $\sin \alpha = \frac{1}{2}$

 $\alpha = \left\{ \frac{\pi}{6}, \frac{5\pi}{6} \right\}$

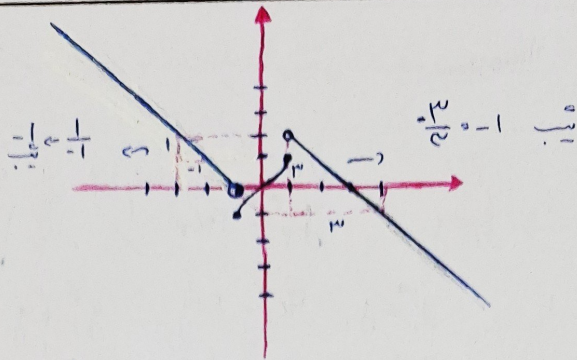
ب) $\cos \alpha = \frac{\sqrt{2}}{2}$

 $\alpha = \left\{ \frac{\pi}{4}, \frac{7\pi}{4} \right\}$

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

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



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



الف) $y = (x-1)(x-3)(x-5)$

x	1	3	5
y	-	+	-

ب) $y = (x-1)(x-3)^2(x-5)$

x	1	3	5
y	+	-	-

الف) $y = \frac{(x-1)(x-5)^2}{(x-3)}$

x	1	3	5
y	-	+	-

ب) $y = \frac{(x-1)(x-5)^2}{(x-3)^2}$

x	1	3	5
y	+	-	-

الف) $y = \frac{x^3 - 3x^2 + 1}{x-3} = \frac{x^3 + 0x^2 - 3x + 1}{x-3} \rightarrow 1 + 0 - 3 + 1 = 0$

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

x	1	3
y	+	-

$\frac{x^3 + 0x^2 - 3x + 1}{x-3} = x^2 + 3x - 2$

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

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

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

x	-1	0	1
y	+	-	-

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

x	
y	+