

الف) $y^3 = 2x^2 - 1 \rightarrow y_1^3 = 2x_1^2 - 1 \xrightarrow{x_1 = x_2} y_1^3 = y_2^3 \rightarrow y_1 = y_2$ تابع هست.

ب) $y^3 + y = 3x^2 - 1 \rightarrow y_1^3 + y_1 = 3x_1^2 - 1 \xrightarrow{x_1 = x_2} y_1^3 + y_1 = y_2^3 + y_2$
 $y_2^3 + y_2 = 3x_2^2 - 1 \rightarrow y_1^3 - y_2^3 + y_1 - y_2 = 0$

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

الف) $y = x^2 - 1 \rightarrow y_1 = x_1^2 - 1 \xrightarrow{x_1 = x_2} y_1 = y_2$ تابع هست.

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

ج) $y^3 + x^3 = 2x - 1 \rightarrow y_1^3 = 2x_1 - x_1^3 - 1 \xrightarrow{x_1 = x_2} y_1^3 = y_2^3 \rightarrow y_1 = y_2$ تابع هست.

د) $\sqrt[3]{y} + \sqrt[3]{x} = 2 \rightarrow \sqrt[3]{y_1} = 2 - \sqrt[3]{x_1} \xrightarrow{x_1 = x_2} \sqrt[3]{y_1} = \sqrt[3]{y_2} \rightarrow y_1 = y_2$ تابع هست.

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

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

ب) $\cot \frac{\sqrt{\pi}}{6} = \frac{\cos 210^\circ}{\sin 210^\circ} = \frac{-\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = \sqrt{3}$

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

الف) $\sin \alpha = \frac{1}{2}$

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



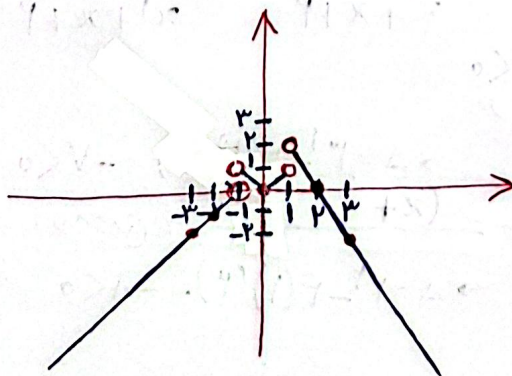
ب) $\cos \alpha = \frac{\sqrt{2}}{2}$



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

$f(x) = \begin{cases} -2x+4, & x > 1 \\ x^2, & -1 < x < 1 \\ x+1, & x < -1 \end{cases}$

$y = -2x+4$ ($x > 1$)	<table border="1"> <tr><th>x</th><th>y</th></tr> <tr><td>1</td><td>2</td></tr> <tr><td>2</td><td>0</td></tr> <tr><td>3</td><td>-2</td></tr> </table> توخالی	x	y	1	2	2	0	3	-2
x	y								
1	2								
2	0								
3	-2								
$y = x^2$ ($-1 < x < 1$)	<table border="1"> <tr><th>x</th><th>y</th></tr> <tr><td>-1</td><td>1</td></tr> <tr><td>0</td><td>0</td></tr> <tr><td>1</td><td>1</td></tr> </table> توخالی	x	y	-1	1	0	0	1	1
x	y								
-1	1								
0	0								
1	1								
$y = x+1$ ($x < -1$)	<table border="1"> <tr><th>x</th><th>y</th></tr> <tr><td>-1</td><td>0</td></tr> <tr><td>-2</td><td>-1</td></tr> <tr><td>-3</td><td>-2</td></tr> </table> توخالی	x	y	-1	0	-2	-1	-3	-2
x	y								
-1	0								
-2	-1								
-3	-2								



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

$$y = -x+3 \quad x > 1$$

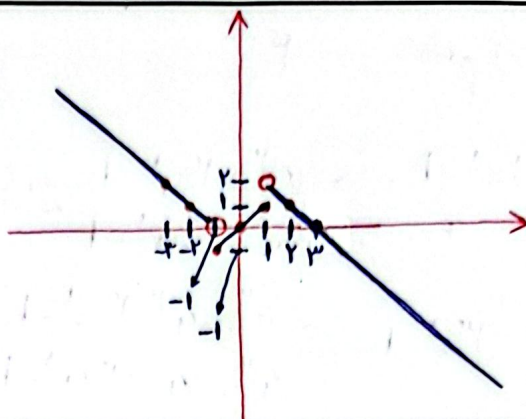
x	y
1	2
2	1
3	0

$$y = x^3-1 \quad -1 \leq x \leq 1$$

x	y
-1	-1
0	0
1	1

$$y = -x-1 \quad x < -1$$

x	y
-1	0
-2	1
-3	2



$$\text{الف) } y = (x-2)(x-3)(x-4)$$

ریشه ها $\rightarrow 2 \quad 3 \quad 4$

x	2	3	4
y	-	+	-

$$\text{ب) } y = (x-2)(x-3)^2(x-4)$$

$$\hookrightarrow y = (x-2)(x-3)(x-3)(x-4)$$

ریشه ها $\rightarrow 2 \quad 3 \quad 3 \quad 4$

x	2	3	4
y	+	-	-

$$\text{الف) } y = \frac{(x-2)(x-4)}{x-3}$$

x	2	3	4
y	-	+	-

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

x	2	3	4
y	+	-	-

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

x	-2	1	3
y	+	-	-

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

x	1	2	3
y	+	+	-

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

$$\hookrightarrow \Delta = 1-4 = -3 < 0$$

مخرج ریشه ندارد (همیشه +)

x	-1	0	1
y	+	-	-

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

صورت و مخرج ریشه ندارند (همیشه +)

$$\Delta = 3^2-4(1)(2) = -7 < 0$$

x	$-\infty$	$+\infty$
y	+	+