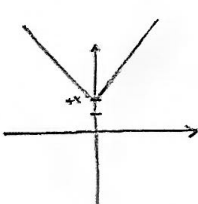
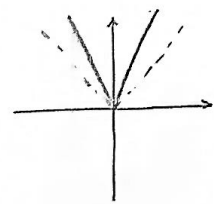
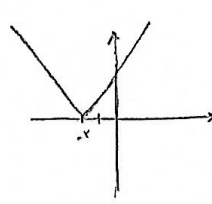
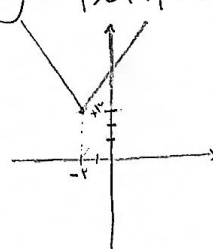
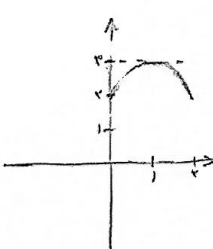
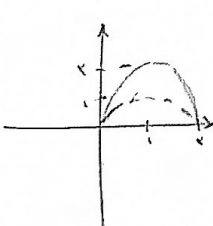
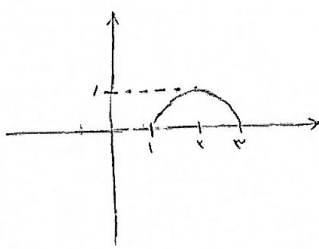
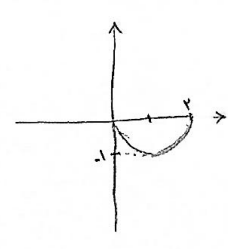


الف) $y^3 - x = 2x^2 \rightarrow \begin{cases} y^3 = 2x^2 + x \\ y^3 = 2x^2 + x \end{cases} \rightarrow y_1 = y_2 \rightarrow y_1 = y_2$ تابع است ✓	۱
ب) $ y + x^2 = x + 2 \rightarrow \begin{cases} y_1 = x + 2 - x^2 \\ y_2 = x + 2 - x^2 \end{cases} \rightarrow y_1 = y_2 \rightarrow y_1 = \pm y_2$ تابع نیست x تابع نیست y تابع نیست (مثلاً $x=1$) ج) $\sqrt{x-4} + y-2 = 0 \rightarrow \begin{cases} x-4 \geq 0 \\ y-2 = 0 \end{cases} \rightarrow x=4, y=2$ تنها نقطه $(4,2)$ تابع است ✓ د) $x = \cos y$ if $x=0 \rightarrow y = \frac{\pi}{2}, \frac{3\pi}{2}$... باشد x تابع نیست y تابع نیست	

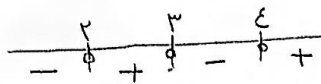
الف) $y = \frac{x+4}{x^2-4x} \rightarrow x^2-4x \neq 0 \rightarrow x \neq 0, 4$ $D_f = \mathbb{R} - \{0, 4\}$	۲
ب) $y = \frac{x+4}{x^2-7x+12} \rightarrow x^2-7x+12 \neq 0 \rightarrow \Delta = b^2-4ac \Rightarrow 49-48=1 > 0 \rightarrow$ ریشه دارد $D_f = \mathbb{R}$	
ج) $y = \frac{x+4}{x^2+x+4} \rightarrow x^2+x+4 \neq 0 \rightarrow \Delta = 1-16=-15 < 0 \rightarrow$ ریشه ندارد $D_f = \mathbb{R}$	
د) $y = \frac{x+4}{x^2-4x^2} \rightarrow x^2-4x^2 \neq 0 \rightarrow x^2(x^2-4) \neq 0 \rightarrow x^2(x-2)(x+2) \neq 0 \rightarrow \begin{cases} x \neq 0 \\ x \neq 2 \\ x \neq -2 \end{cases} D_f = \mathbb{R} - \{0, 2, -2\}$	

الف) $y = \sqrt{4-x} + \sqrt{x-2} \rightarrow \begin{cases} 4-x \geq 0 \rightarrow x \leq 4 \\ x-2 \geq 0 \rightarrow x \geq 2 \end{cases} \rightarrow 2 \leq x \leq 4 \rightarrow D_f = [2, 4]$	۳
ب) $y = \frac{x^2+1}{x^2+1} \rightarrow x^2+1 \neq 0 \rightarrow x \neq \pm 1$ $D_f = \mathbb{R} - \{1, -1\}$	
ج) $y = \frac{\sqrt{x-2}}{x-4} \rightarrow \begin{cases} x-2 \geq 0 \rightarrow x \geq 2 \\ x-4 \neq 0 \rightarrow x \neq 4 \end{cases} D_f = [2, +\infty) - \{4\}$	
د) $y = \frac{x^2+2}{ x +x^2} \rightarrow x +x^2 \neq 0 \rightarrow x \neq 0 \rightarrow D_f = \mathbb{R} - \{0\}$	

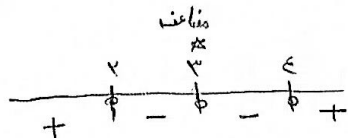
الف) $y = x + 2$	ب) $y = 2 x $	ج) $y = x+2 $	د) $y = x+2 + 2$	۴
				

الف) $f(x) + 2$	ب) $2f(x)$	ج) $f(x-1)$	د) $-f(x)$	۵
				

الف) $y = (x-2)(x-3)(x-4)$

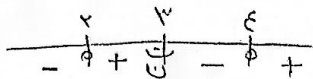


ب) $y = (x-2)(x-3)^2(x-4)$

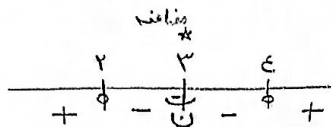


4

الف) $y = \frac{(x-2)(x-4)}{x-3}$

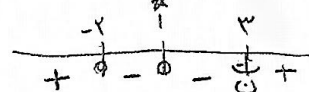


ب) $y = \frac{(x-2)(x-4)}{(x-3)^2}$

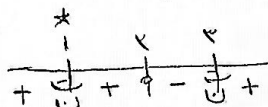


5

الف) $y = \frac{x^3 - 3x^2 + 2x}{x-3} \rightarrow$ بخش پذیری بر $(x-1)$ $\rightarrow \begin{array}{r} x^3 - 3x^2 + 2x : x-1 \\ \underline{-(x^3 - x^2)} \\ x^2 - 2x \\ \underline{-(x^2 - x)} \\ -x + 2 \\ \underline{-(-x + 1)} \\ 1 \end{array} \quad \begin{array}{r} x-1 \\ \underline{-(x^3 - x^2)} \\ x^2 - 2x \\ \underline{-(x^2 - x)} \\ -x + 2 \\ \underline{-(-x + 1)} \\ 1 \end{array} \quad \frac{(x-1)(x-1)(x+2)}{(x-3)^2}$

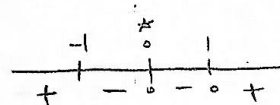


ب) $y = \frac{x^3 - 3x^2 + 2x}{x^2 - 4x + 3} \rightarrow \frac{(x-1)(x-2)}{(x-1)(x-3)} \rightarrow \frac{(x-2)}{(x-3)}$



6

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

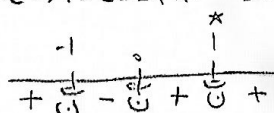


$\Delta = b^2 - 4ac \rightarrow 1 - 4 = -3 < 0 \rightarrow$ ریشه ندارد

ب) $y = \frac{x^2 + 3x + 2}{x^2 + 2x + 3} \rightarrow \Delta = 9 - 12 = -3 < 0 \rightarrow$ ریشه ندارد
 $\Delta = 4 - 12 = -8 < 0 \rightarrow$ ریشه ندارد
 همیشه مثبت است

7

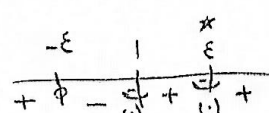
الف) $y = \sqrt{\frac{x^2 - 1}{x^2 - x}} \geq 0 \rightarrow \frac{(x-1)(x+1)}{x(x-1)}$



$(-1, 0) \cup (1, +\infty)$

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

ب) $y = \sqrt{\frac{x^2 - 14}{x^2 - 5x + 6}} \geq 0 \rightarrow \frac{x^2 - 14}{x^2 - 5x + 6} \rightarrow \frac{(x-4)(x+4)}{(x-1)(x-6)}$



$D_f = (-\infty, -4] \cup (1, 4) \cup (6, +\infty)$

8