

الف) $y^3 - x = 2x^2 \leadsto y^3 = 2x^2 + x, y^3 = 2x^2 + x \leadsto y_1 = y_2 \Rightarrow y_1 = y_2 \checkmark$

ب) $|y| + x^2 = x + 3 \leadsto x = 0 \leadsto |y| = 3 \leadsto y = \pm 3 \checkmark$

ج) $\sqrt{x-4} + |y-2| = 0 \leadsto \sqrt{x-4} = |y-2| = 0 \leadsto x=4, y=2 \checkmark$

د) $x = \cos y \leadsto x = 0 \leadsto y = 90, 270 \checkmark$

الف) $y = \frac{x+f}{x^2-fx} = \frac{x+f}{x(x-f)} \leadsto x \neq 0, f, D_f = \mathbb{R} - \{0, f\}$ ~~$D = (-\infty, 0) \cup (0, f) \cup (f, +\infty)$~~ $(-\infty, 0) \cup (0, f) \cup (f, +\infty)$

ب) $y = \frac{x+f}{x^2 - \sqrt{x} + 4} \leadsto \Delta = b^2 - 4ac = 4 - 4f = -4f \leadsto \Delta < 0 \leadsto D = \mathbb{R}$

ج) $y = \frac{x+f}{x^2 + x + f} \leadsto \Delta = b^2 - 4ac = 1 - 4f = -4f \leadsto \Delta < 0 \leadsto D = \mathbb{R}$

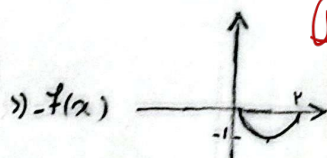
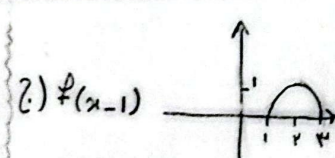
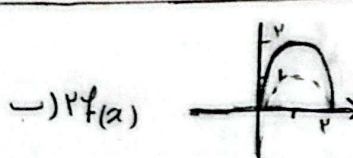
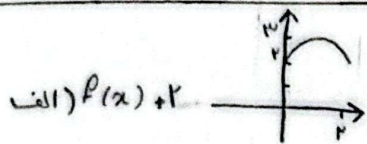
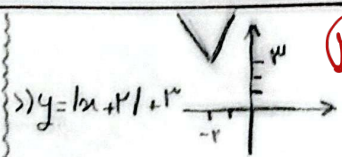
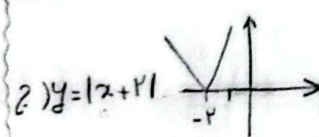
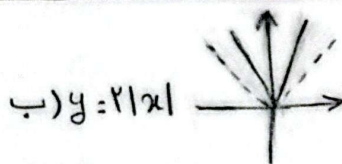
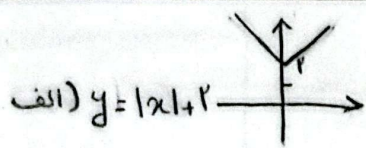
د) $y = \frac{x+f}{x^2 - fx} = \frac{x+f}{x^2(x-f)} \leadsto D = \mathbb{R} - \{0, \pm f\} \leq D = (-\infty, -f) \cup (-f, 0) \cup (0, f) \cup (f, +\infty)$

الف) $y = \sqrt{4-x} + \sqrt{x-2} \leadsto 4-x \geq 0 \leadsto x \leq 4, x-2 \geq 0 \leadsto x \geq 2 \Rightarrow 2 \leq x \leq 4 \leadsto D = [2, 4]$

ب) $y = \frac{x^2+1}{x^2+1} \leadsto D = \mathbb{R}$

ج) $y = \frac{\sqrt{x-2}}{x-f} \leadsto x-f \neq 0 \leadsto x \neq f, x-2 \geq 0 \leadsto x \geq 2 \Rightarrow D = [2, f) \cup (f, +\infty)$

د) $y = \frac{x^2+3}{|x|+x^2} \leadsto |x|+x^2 \neq 0 \leadsto x \neq 0 \Rightarrow D = (-\infty, 0) \cup (0, +\infty)$



الف) $y = (x-2)(x-3)(x-4)$

۲	۳	۴
-	+	-
+	-	+

ب) $y = (x-2)(x-3)^2(x-4)$

۲	۳	۴
+	-	-
-	+	+

الف) $y = \frac{(x-2)(x-4)}{x-3}$

۲	۳	۴
-	+	-
+	-	+

ب) $y = \frac{(x-2)(x-4)}{(x-3)^2}$

۲	۳	۴
+	-	-
-	+	+

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

۲	۱	۳
+	-	-
-	+	+

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

۱	۲	۳
+	+	-
-	-	+

الف) $y = \frac{x^4 - x^2}{x^2 + x + 2} = \frac{x^2(x+1)(x-1)}{x^2 + x + 2} \leadsto x^2 + x + 2 > 0$
 $\Delta < 0 \quad \uparrow$

$$\begin{array}{c} -1 \quad 0 \quad 1 \\ \hline + \quad - \quad - \quad + \\ \hline \end{array}$$

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ب) $y = \frac{x^4 + 3x + 4}{x^2 + 2x + 3} \leadsto x^2 + 3x + 4 > 0, x^2 + 2x + 3 > 0$
 $\Delta < 0 \quad \uparrow \quad \Delta < 0 \quad \uparrow \Rightarrow$ همواره مثبت

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

$$\begin{array}{c} -1 \quad 0 \quad 1 \\ \hline + \quad - \quad + \\ \hline \end{array}$$

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

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

$$\begin{array}{c} -4 \quad 1 \quad 4 \\ \hline + \quad - \quad + \\ \hline \end{array}$$

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