

①

$$\text{الف) } y^3 - x = 2x^2 \rightarrow \left. \begin{array}{l} y_1^3 - x_1 = 2x_1^2 \\ y_2^3 - x_2 = 2x_2^2 \end{array} \right\} \begin{array}{l} x_1 = x_2 \\ y_1^3 = y_2^3 \end{array} \rightarrow y = y \text{ تابع است } \checkmark$$

$$\text{ب) } |y| + x^2 = x + 3 \quad |y| + 1 = 1 + 3 \quad 4 - 1 = 3 \quad |y| = 3 \rightarrow y = \pm 3 \text{ تابع نیست } \times$$

$$\text{ج) } \sqrt{x-4} + |y-2| = 0 \quad \begin{array}{l} x-4=0 \\ |y-2|=0 \end{array} \rightarrow y-2=0 \rightarrow y=2 \text{ تابع است } \checkmark$$

$$\text{د) } x = \cos y \quad x=0 \rightarrow y = \frac{\pi}{2}, \frac{3\pi}{2} = 1, -1 \text{ تابع نیست } \times$$

②

$$\text{الف) } x(x-4) \neq 0 \rightarrow x \neq 0, 4 \rightarrow D_f = \mathbb{R} - \{0, 4\}$$

$$\text{ب) } \Delta = b^2 - 4ac = 49 - 44 = 5 \rightarrow \text{دو ریشه متمایز} \rightarrow x^2 - 7x + 14 \neq 0 \rightarrow D_f = \mathbb{R}$$

$$\text{ج) } \Delta = b^2 - 4ac = 1 - 14 = -13 \rightarrow \text{دو ریشه متمایز} \rightarrow x^2 - x + 4 \neq 0 \rightarrow D_f = \mathbb{R}$$

$$\text{د) } x^4 - 4x^2 \neq 0 \quad x^2(x^2 - 4) = x^2(x-2)(x+2) \neq 0 \rightarrow x \neq 0, 2, -2 \rightarrow D_f = \mathbb{R} - \{-2, 0, 2\}$$

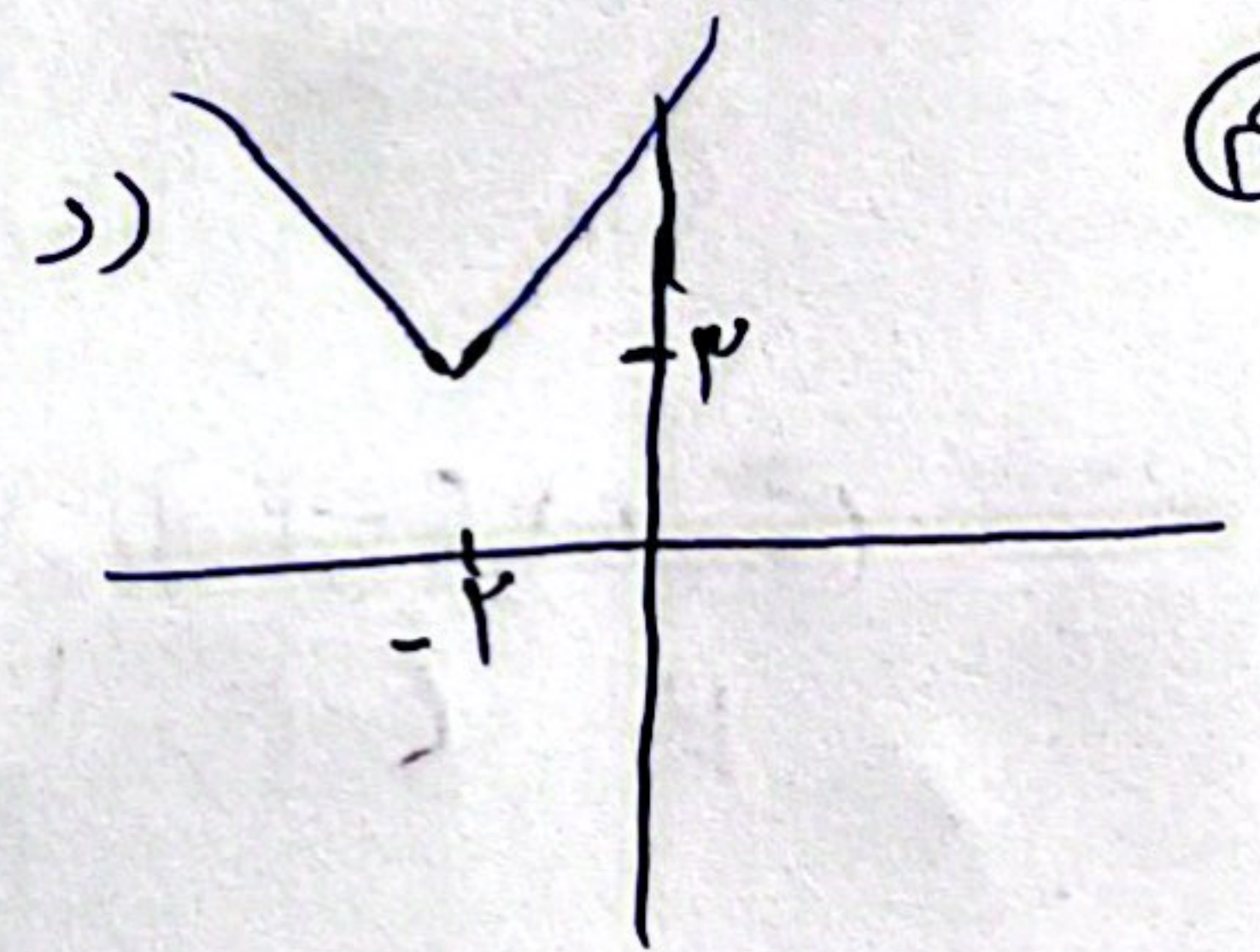
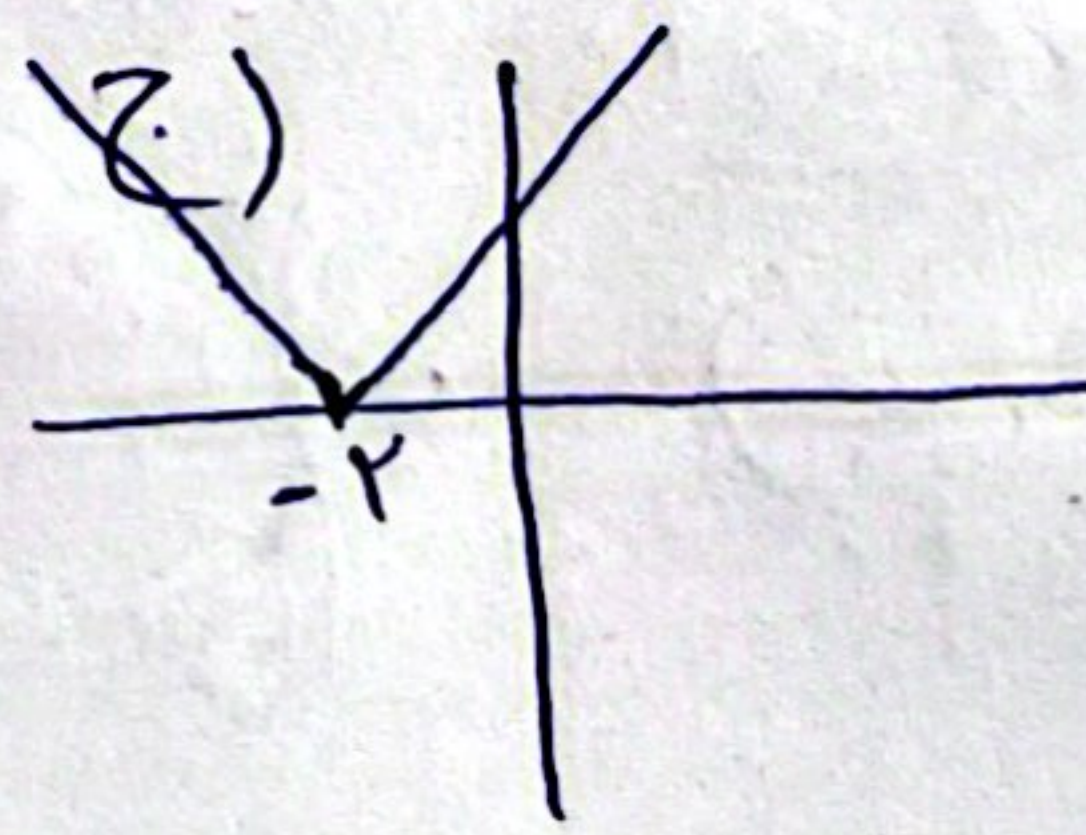
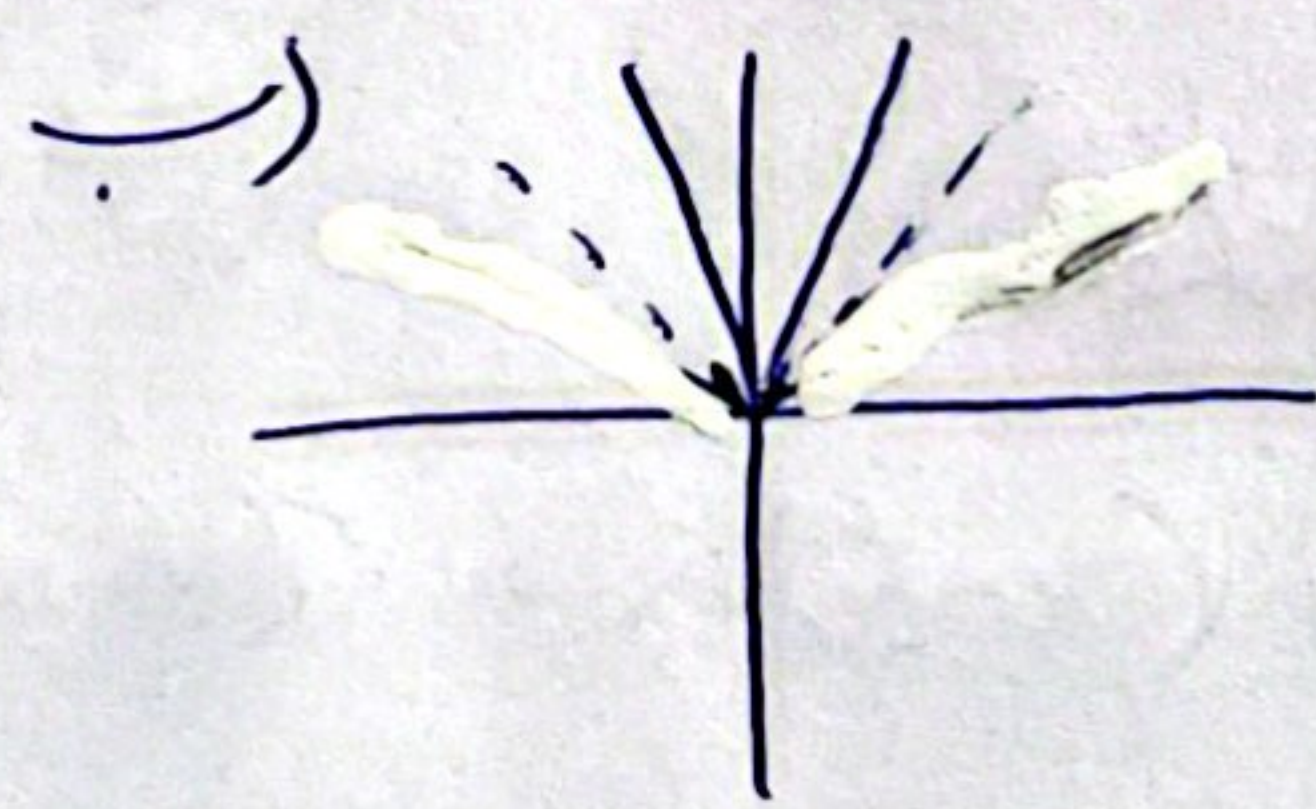
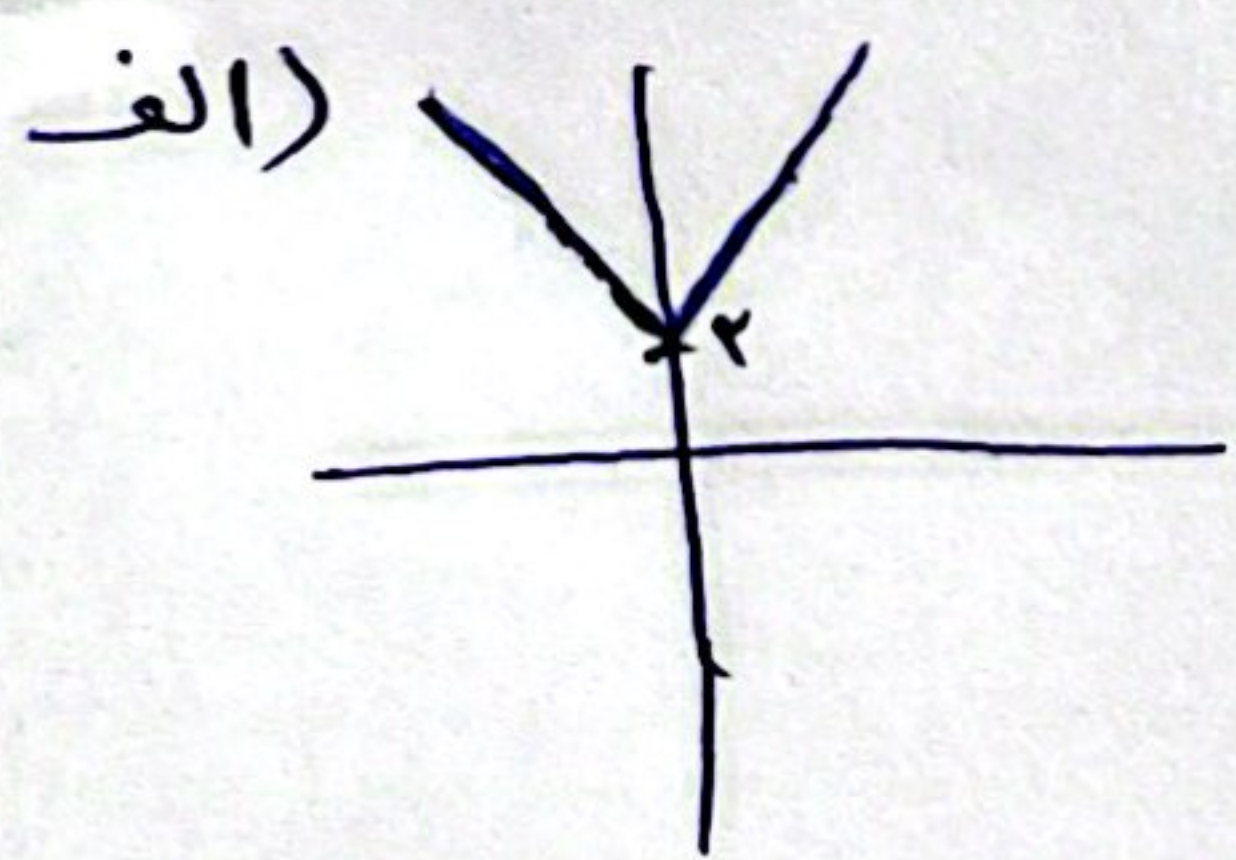
③

$$\text{الف) } \begin{array}{l} 4-x \geq 0 \\ x \leq 4 \end{array} \quad \begin{array}{l} x-2 \geq 0 \\ x \geq 2 \end{array} \rightarrow 2 \leq x \leq 4 \rightarrow D_f = [2, 4]$$

$$\text{ب) } \begin{array}{l} x^2+1 \neq 0 \\ x^2 \neq -1 \end{array} \rightarrow D_f = \mathbb{R}$$

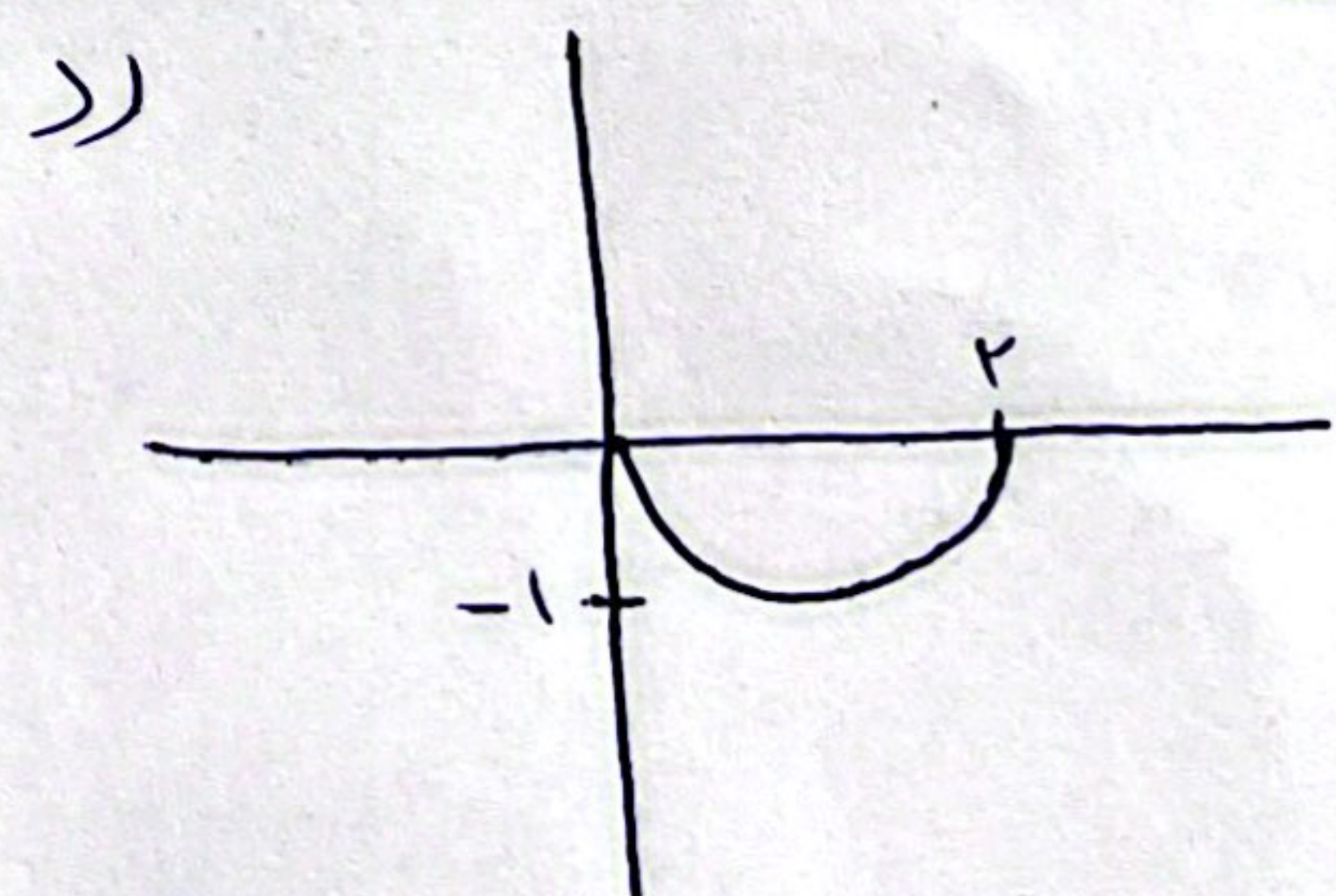
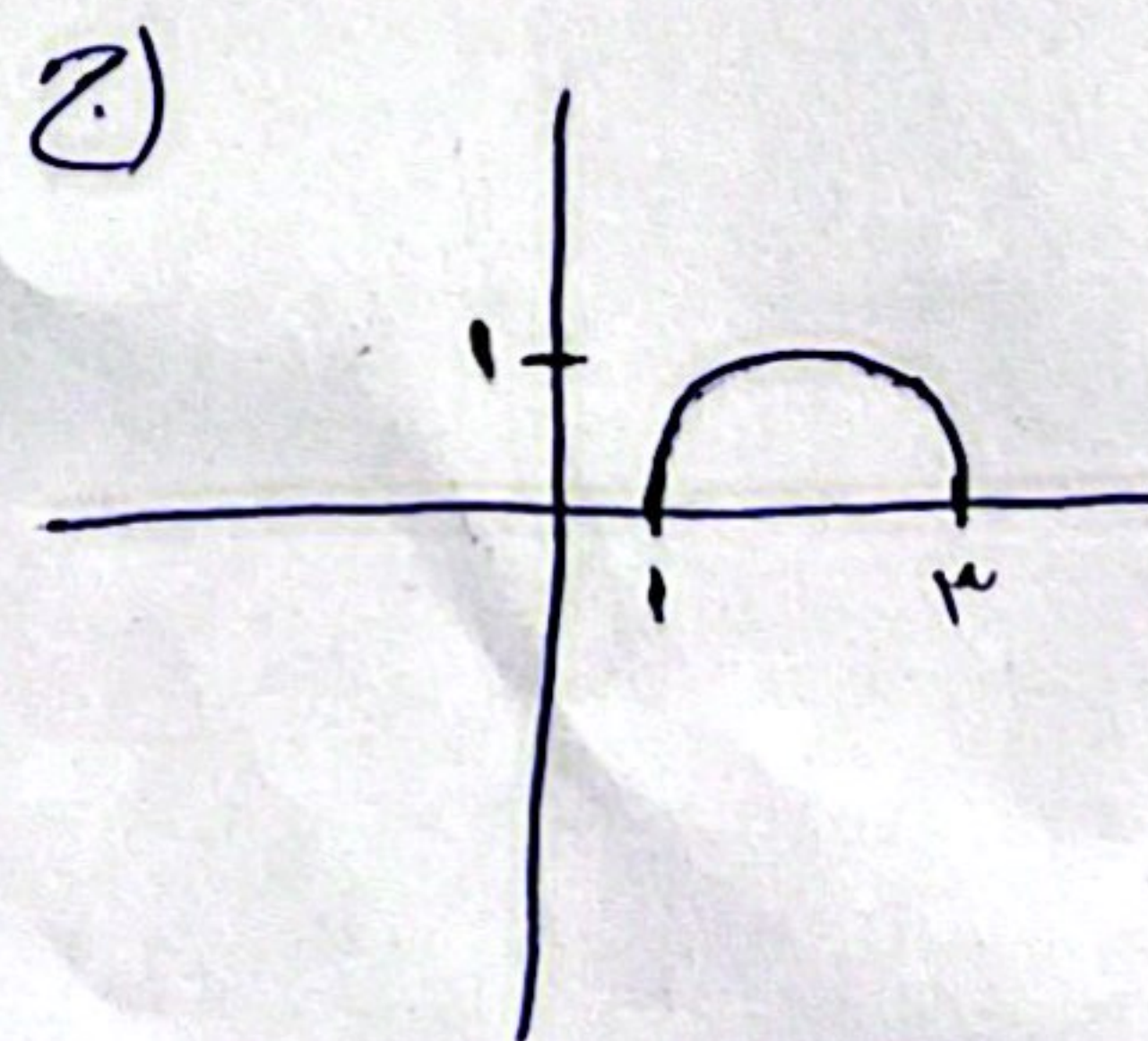
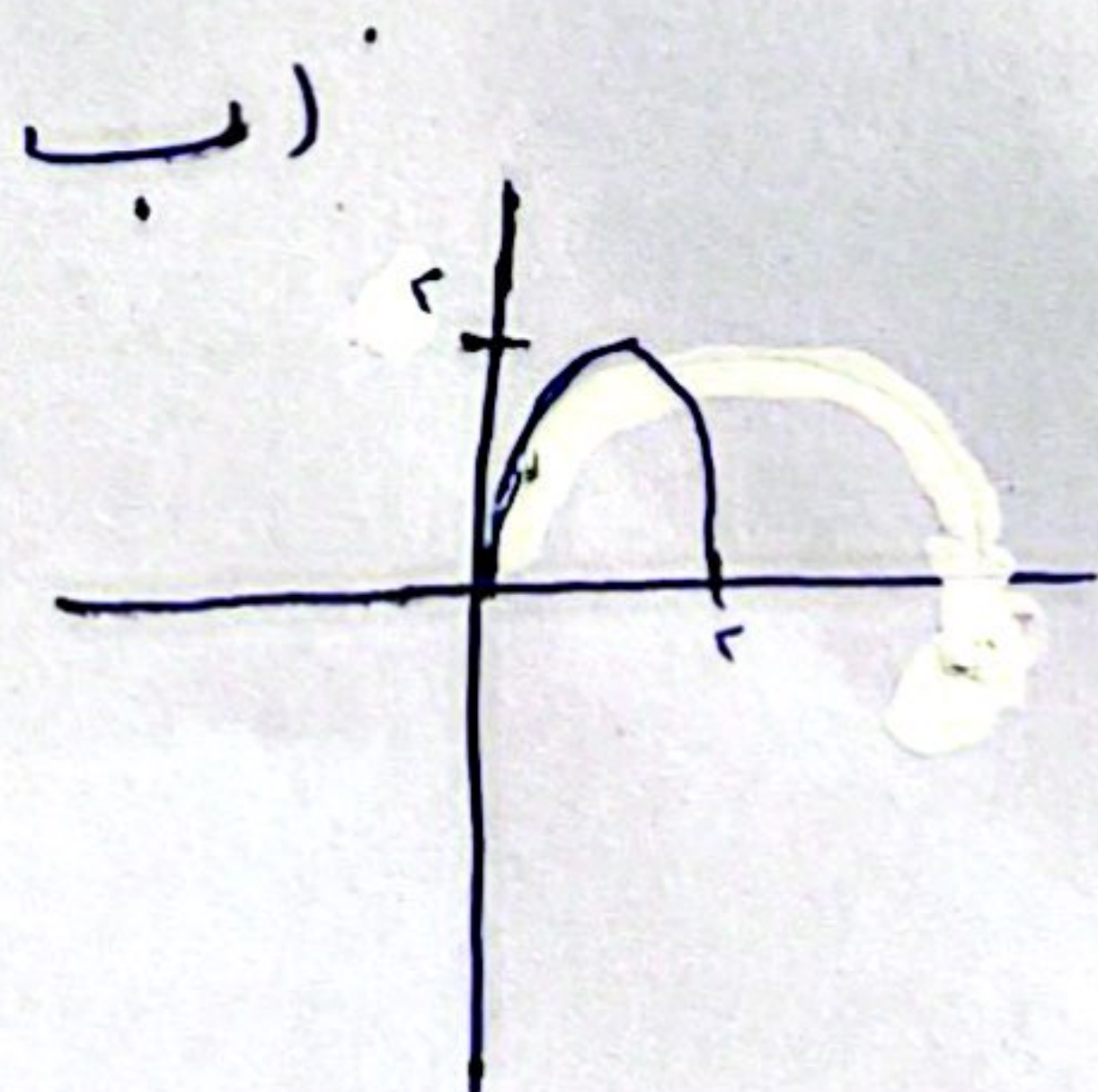
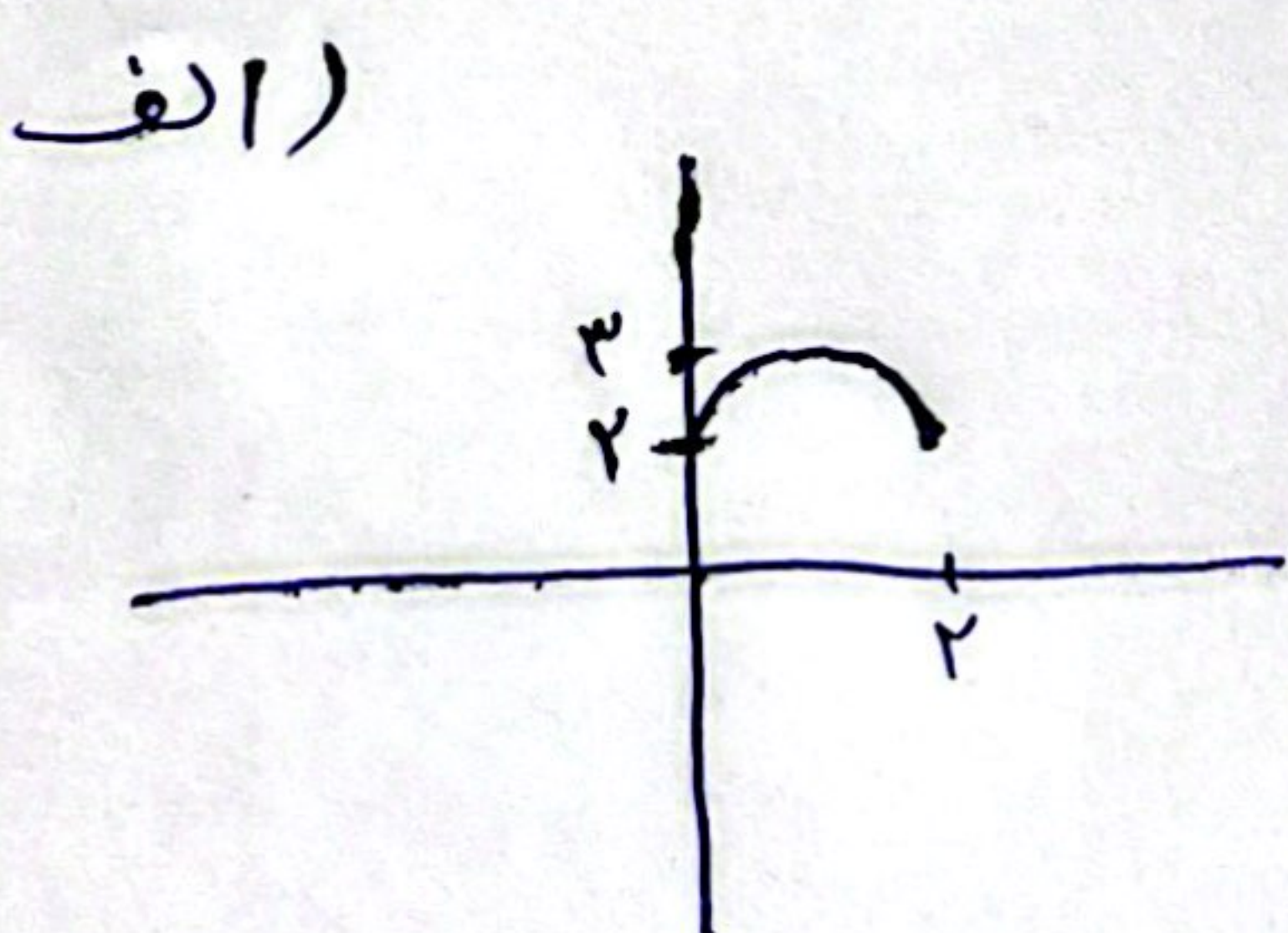
$$\text{ج) } \begin{array}{l} x-2 \geq 0 \\ x \geq 2 \end{array} \quad \begin{array}{l} x-4 \neq 0 \\ x \neq 4 \end{array} \rightarrow D_f = [2, 4), (4, +\infty)$$

$$\text{د) } |x| + x^2 \neq 0 \rightarrow x \neq 0 \rightarrow D_f = \mathbb{R} - \{0\}$$



④

⑤



الف) $\frac{x^2}{-x+1} + \frac{x^3}{x-2} + \frac{x^4}{x+3} \rightarrow [2, 3] \cup [4, +\infty)$

(2)

ب) $\frac{x^2}{+x-1} + \frac{x^3}{-x-2} + \frac{x^4}{-x+3} \rightarrow (-\infty, 2] \cup \{3\} \cup [4, +\infty)$

(3)

الف) $\frac{x^2}{-x+1} + \frac{x^3}{x-2} + \frac{x^4}{-x+3} \rightarrow [2, 3) \cup [4, +\infty)$

ب) $\frac{x^2}{+x-1} + \frac{x^3}{-x-2} + \frac{x^4}{-x+3} \rightarrow (-\infty, 2] \cup [4, +\infty)$

(4)

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

ب) $\frac{(x-1)(x-5)}{(x-1)(x-3)} \rightarrow \frac{x^2-6x+5}{x^2-4x+3} \Rightarrow \frac{1}{+} \frac{2}{+} \frac{3}{-}$

(5)

الف) $\frac{x^2(x^2-1)}{x^2+x^2+2} \rightarrow x=0, 1, -1$
 $x^2+x^2+2 \rightarrow \Delta = b^2-4ac \rightarrow 1-8=-7$ $\rightarrow \frac{-1}{+} \frac{0}{-} \frac{1}{-}$

ب) $\frac{x^2+3x+2}{x^2+2x+3} \rightarrow \Delta = b^2-4ac \rightarrow \Delta = 9-12=-3$
 $\rightarrow \Delta = 4-12=-8$ $\rightarrow \frac{1}{+} \frac{0}{-} \frac{1}{-}$

(6)

الف) $\frac{x^3-1}{x^2-x} \geq 0 \Rightarrow \frac{(x-1)(x^2+x+1)}{x(x-1)(x+1)}$

$\frac{-1}{+} \frac{0}{-} \frac{1}{+}$

$\Rightarrow D_f = (-\infty, -1) \cup (1, +\infty) \cup (0, 1)$
 $R - [-1, 0] \cup \{1\}$

ب) $\frac{x^2-14}{x^2-8x+4} \geq 0 \Rightarrow \frac{(x-4)(x+4)}{(x-1)(x-5)}$

$\frac{-4}{+} \frac{1}{-} \frac{4}{+}$

$D_f = (-\infty, -4] \cup (1, 4) \cup (5, +\infty)$
 $R - [-4, 1] \cup [4, 5]$