

الف) $y^3 - x = 2x^2 \rightarrow y^3 - x_1 = 2x_1^2$
 $y_1^3 - x_2 = 2x_2^2$ } $y_1 = y_2 \rightarrow y = y$ تابع است ✓

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

ج) $\sqrt{x-4} + |y-2| = 0$
 $x=4 \quad |y-2|=0 \rightarrow y-2=0 \rightarrow y=2$ تابع است ✓

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

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

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

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

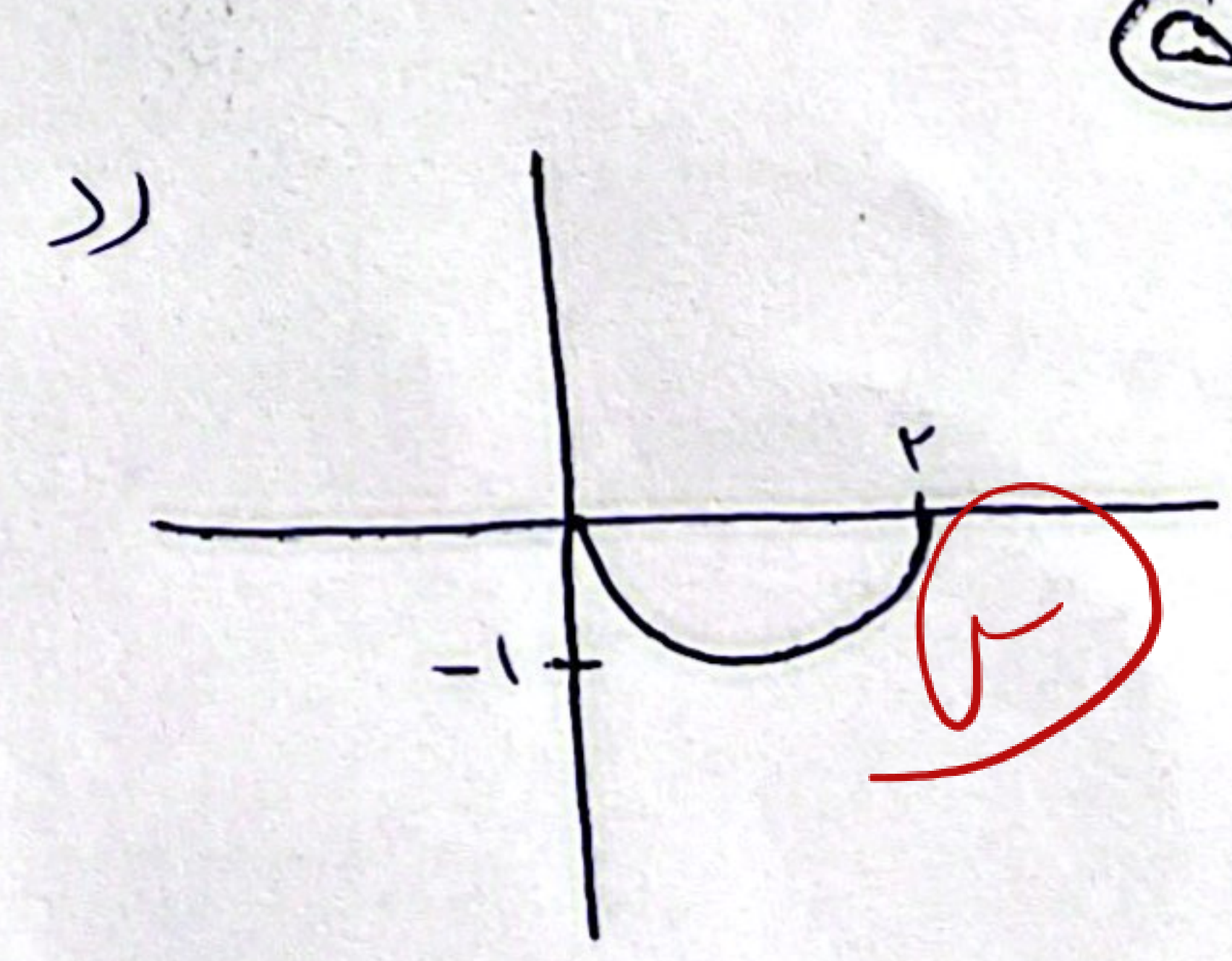
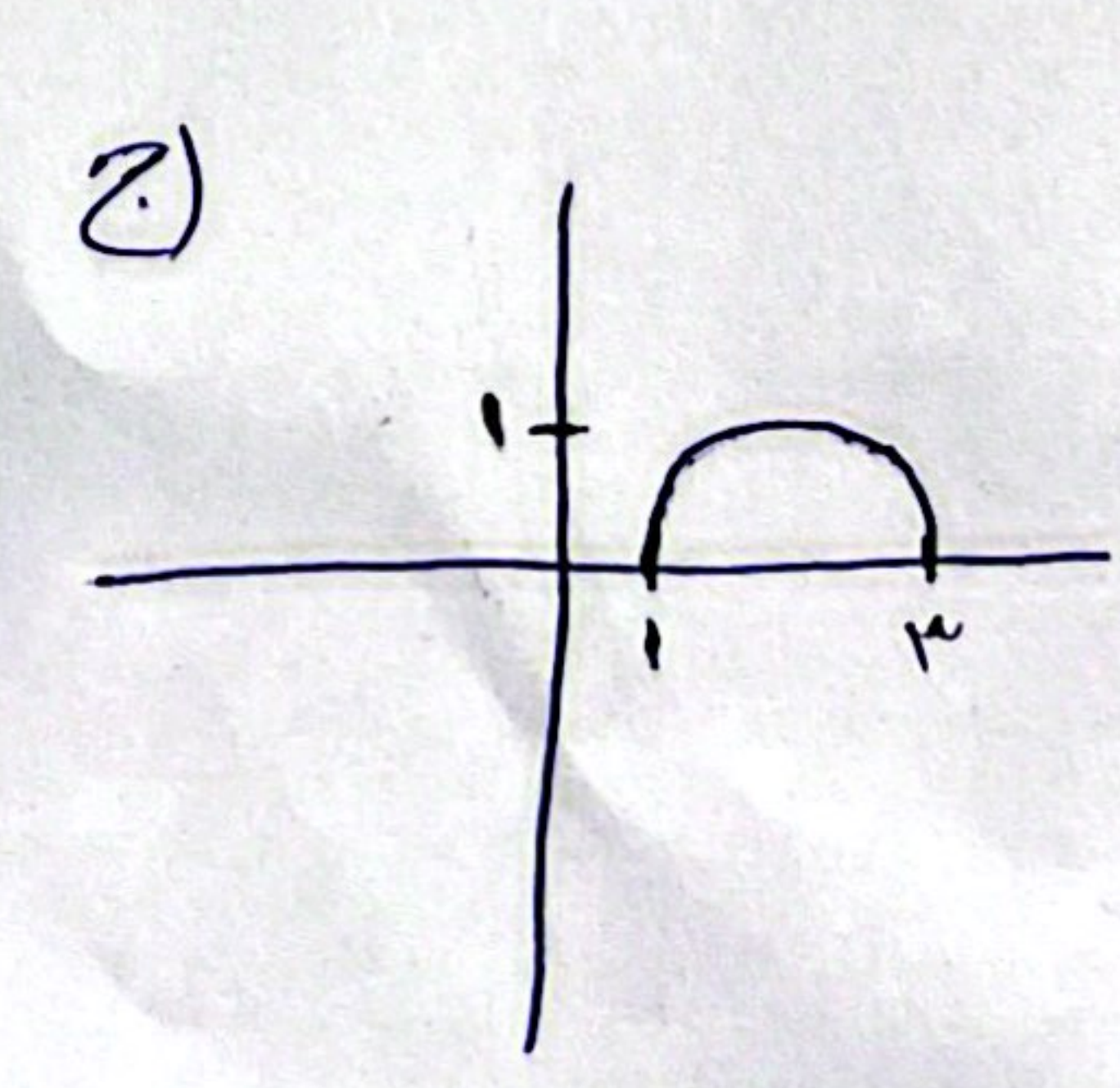
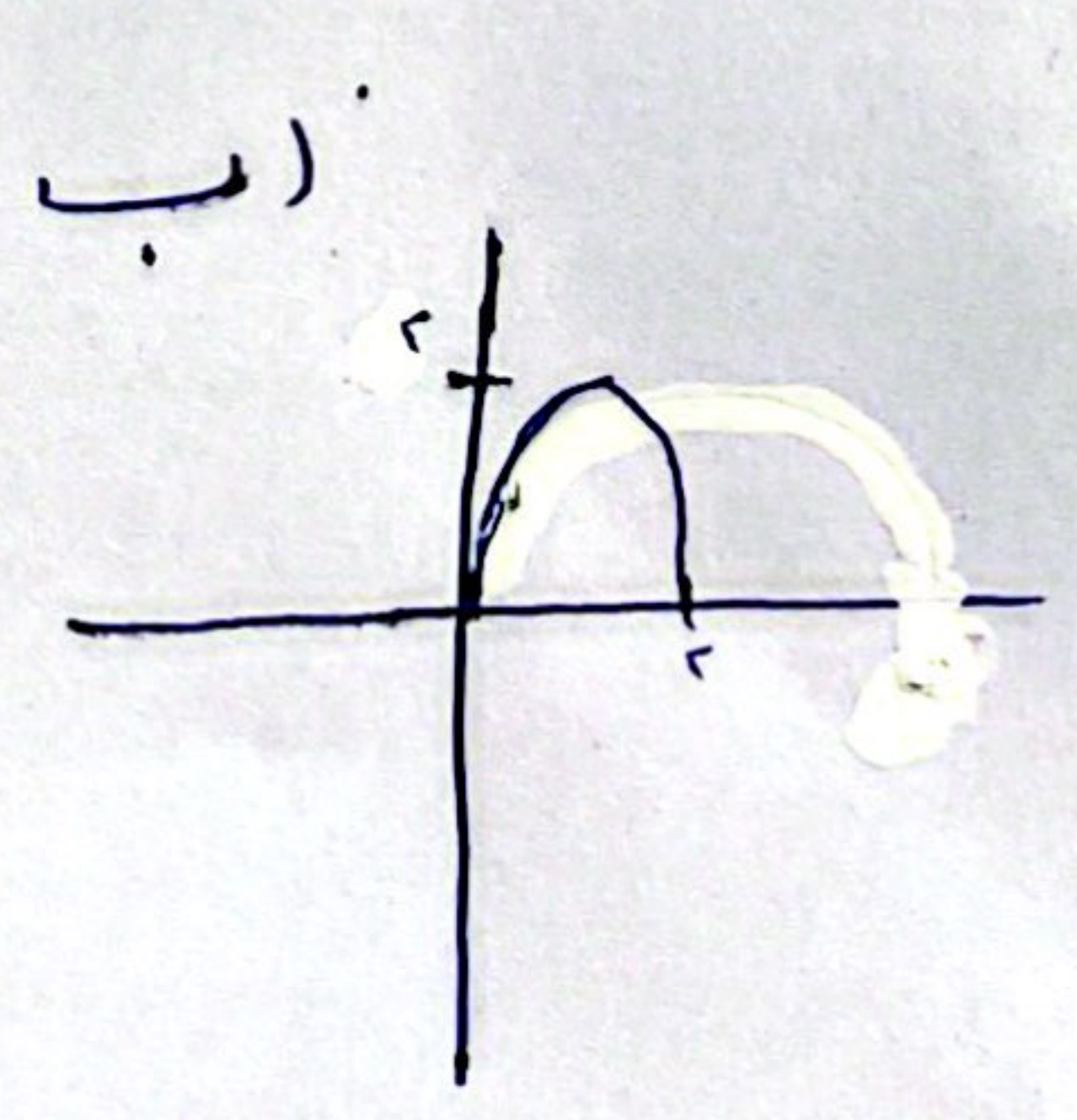
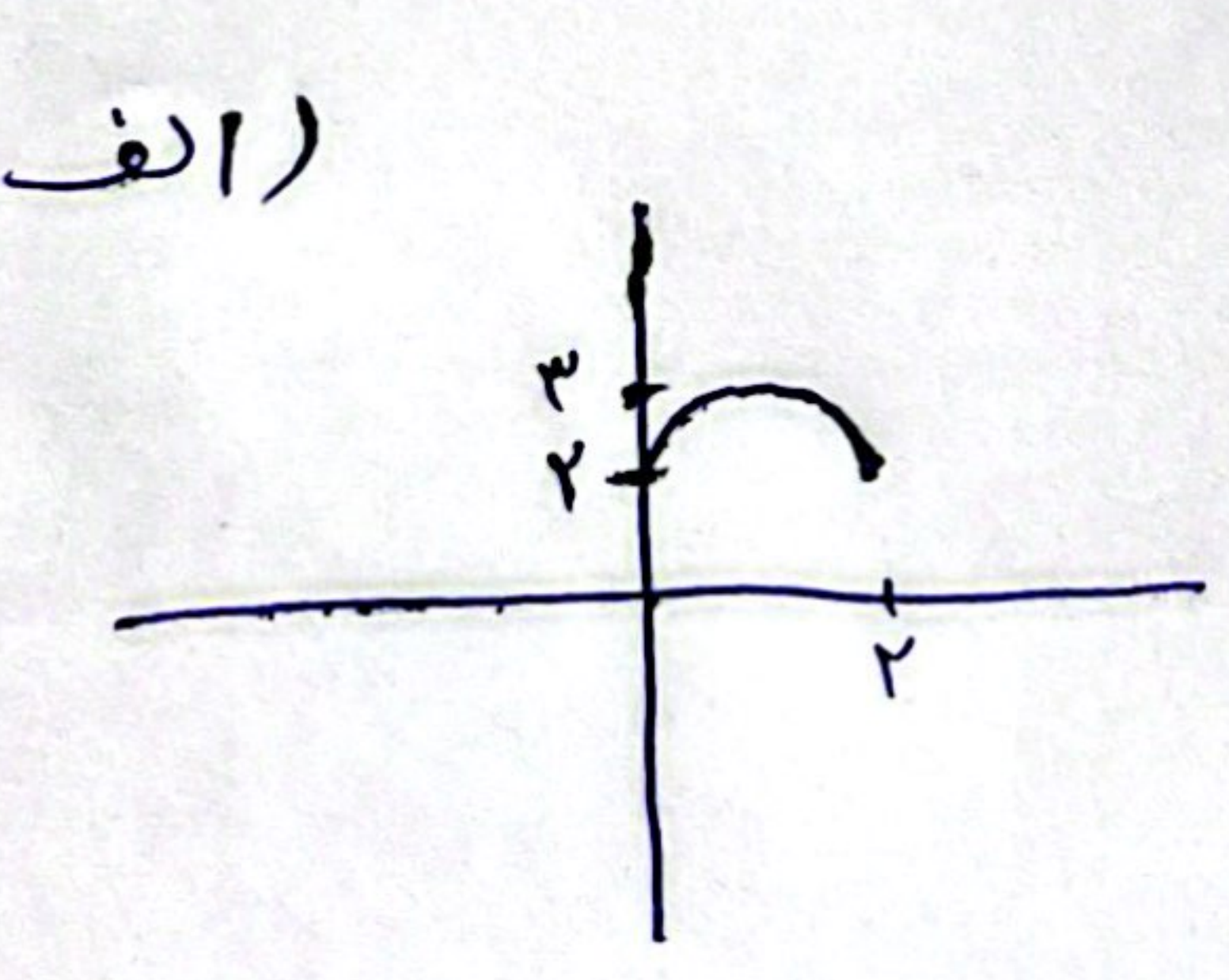
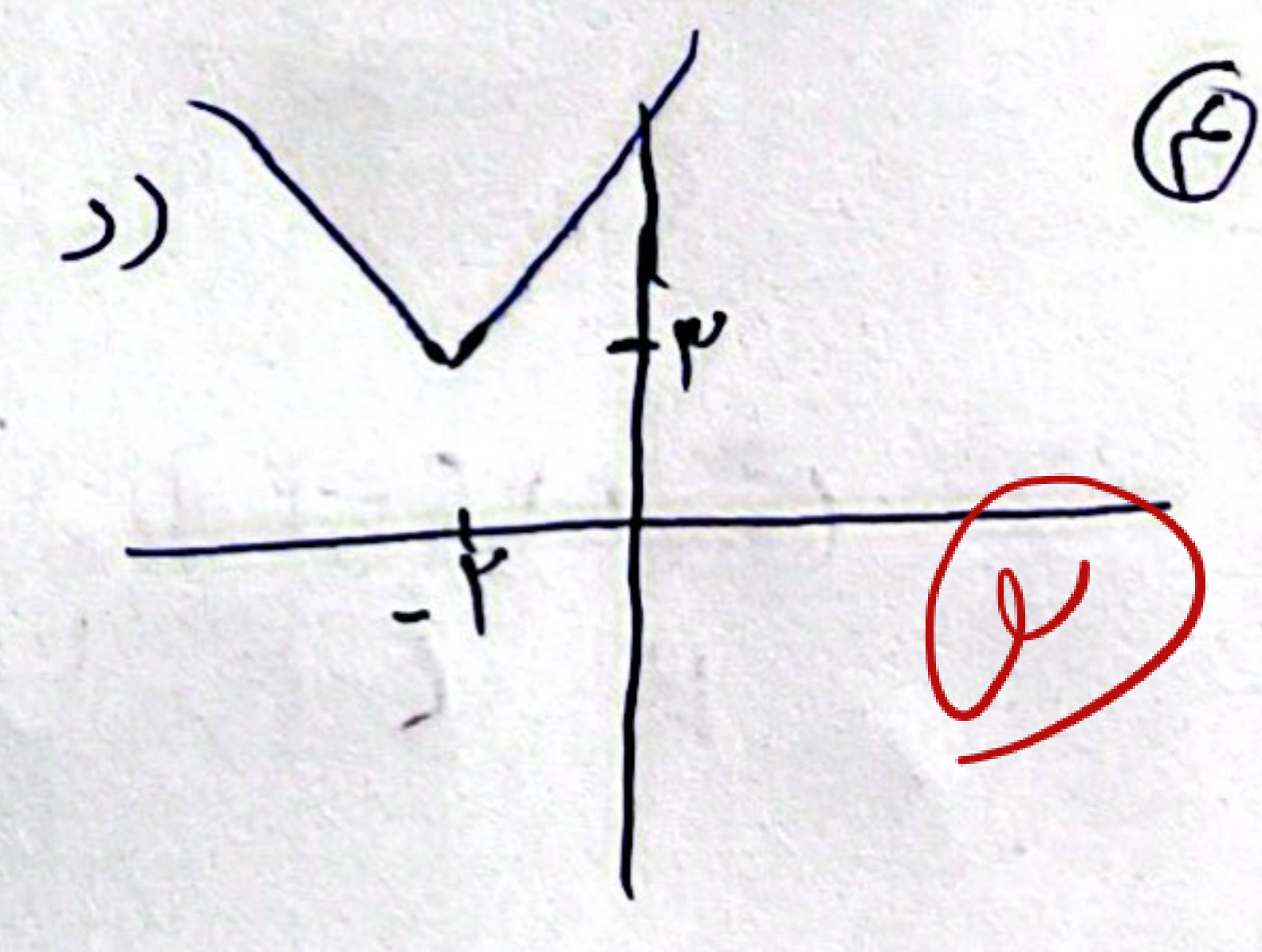
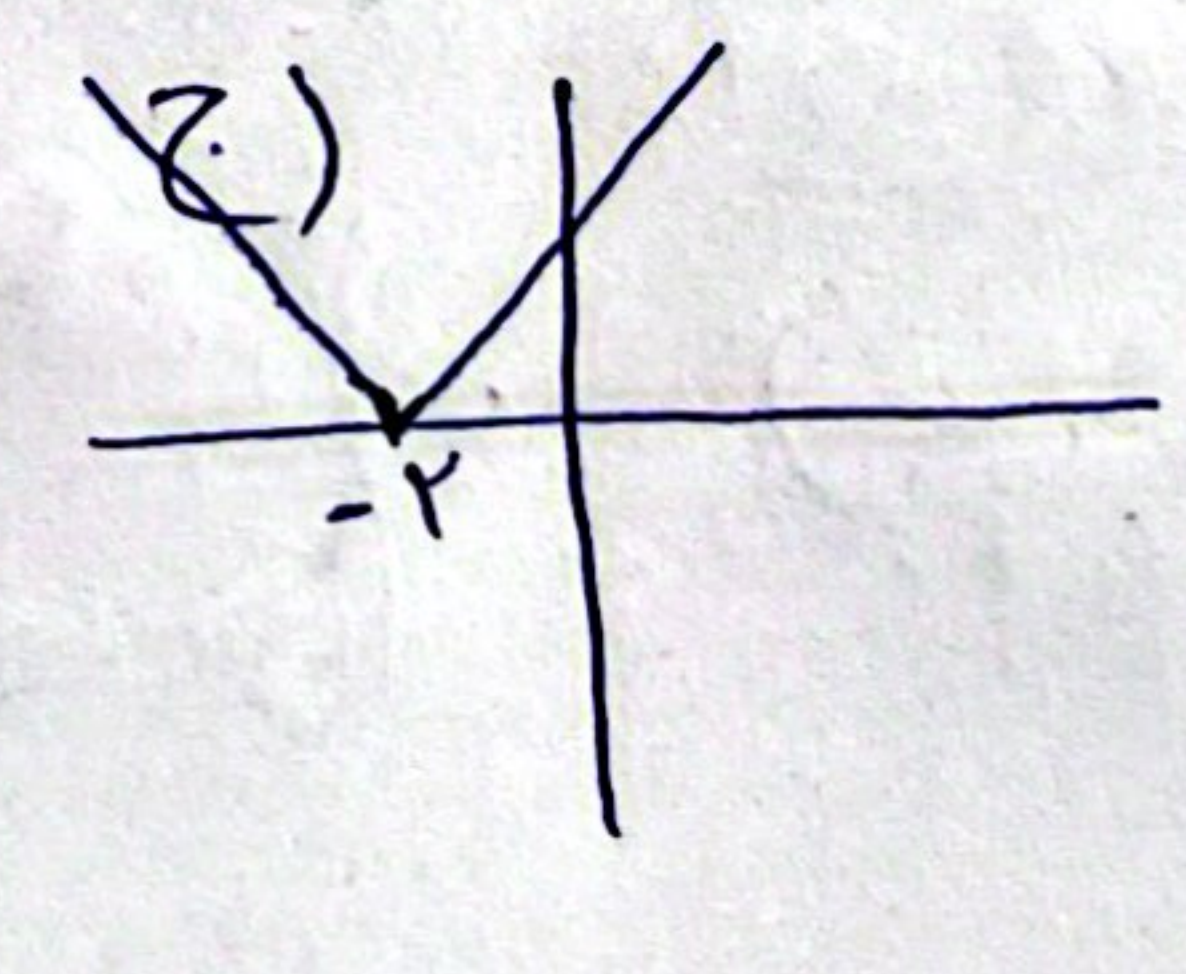
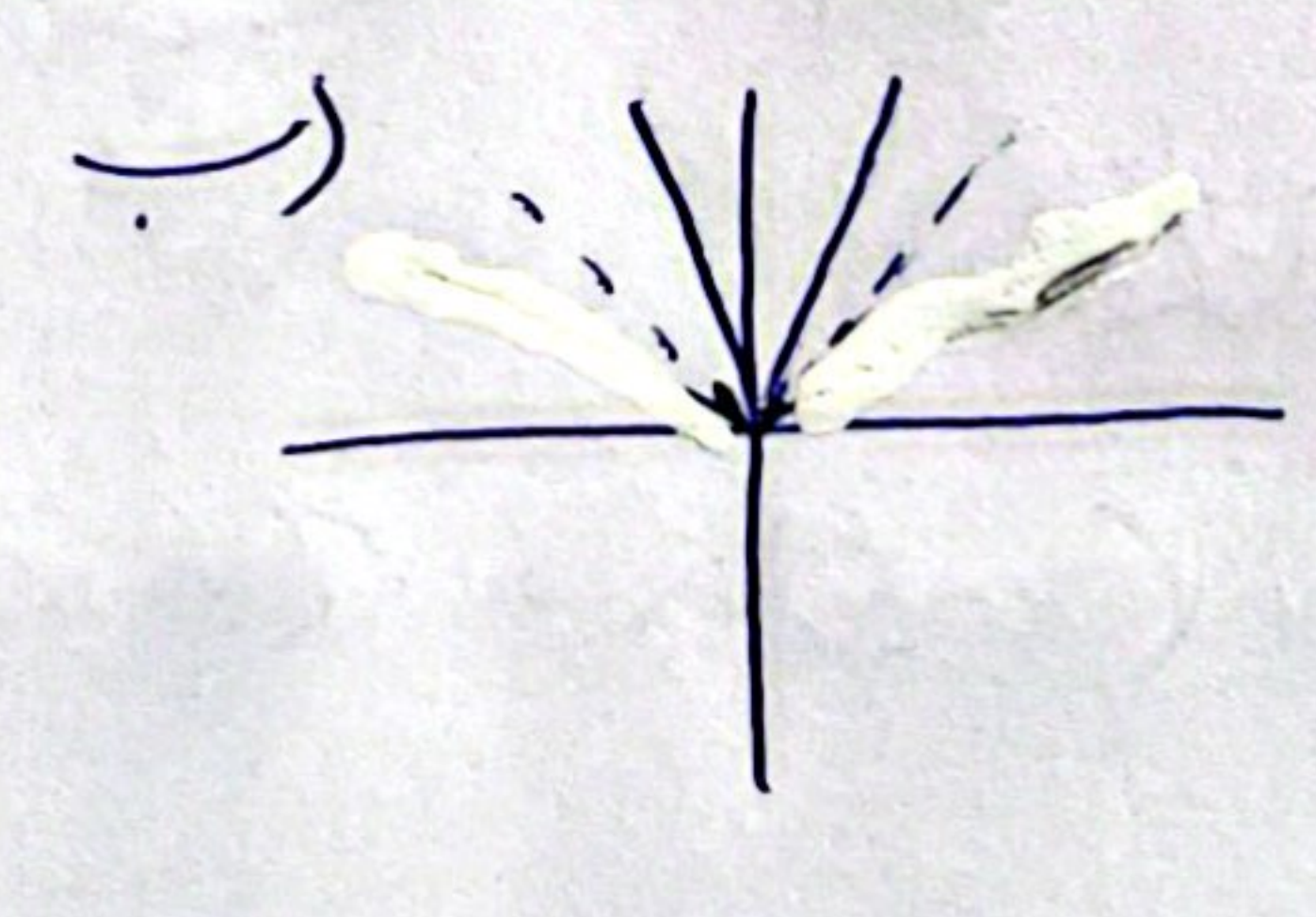
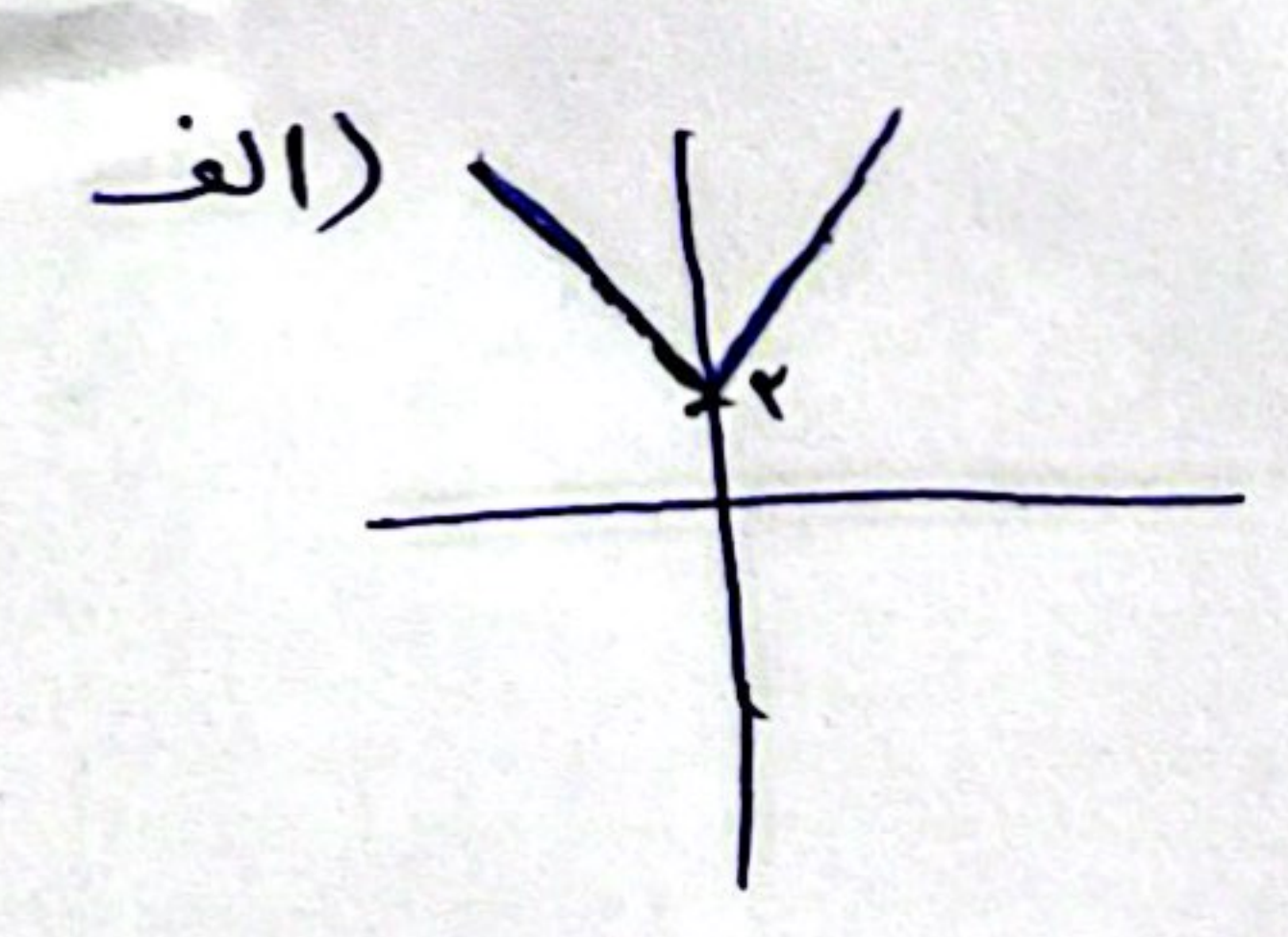
د) $x^4 - 4x^2 \neq 0$
 $x^2(x^2 - 4) = x^2(x-2)(x+2) \neq 0 \rightarrow x \neq 0, 2, -2 \rightarrow D_f = \mathbb{R} - \{-2, 0, 2\}$

الف) $4-x \geq 0 \quad x-2 \geq 0$
 $x \leq 4 \quad x \geq 2 \rightarrow 2 \leq x \leq 4 \rightarrow D_f = [2, 4]$

ب) $x^2 + 1 \neq 0$
 $x^2 \neq -1 \times \rightarrow D_f = \mathbb{R}$

ج) $x-2 \geq 0 \quad x-4 \neq 0$
 $x \geq 2 \quad x \neq 4 \rightarrow D_f = [2, 4) \cup (4, +\infty)$

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



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

②

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

⑤

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

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

①

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

③

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

④

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

②

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

⑩

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

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

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

③

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

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

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