

الف) $y = \sqrt{\frac{x^2 - 4x}{x^3 - x}} \Rightarrow \frac{x(x-4)}{x(x-1)(x+1)} \Rightarrow \frac{-1 \quad 0 \quad 1 \quad 4}{- \quad + \quad + \quad -} \Rightarrow x \in (-1, 0) \cup (0, 1) \cup [4, +\infty)$

ب) $y = \sqrt{\frac{x^4 - x^3}{x^3 - x}} \Rightarrow \frac{x^3(x+1)(x-1)}{x(x+1)(x-1)} \Rightarrow \frac{-1 \quad 1 \quad 1}{+ \quad + \quad +} \Rightarrow x \in (-\infty, -1) \cup (-1, 0) \cup (0, 1) \cup [1, +\infty)$

$y = \frac{x+1}{\sqrt{x+1}x} \Rightarrow \sqrt{x+1}x > 0 \Rightarrow x+1 > 0 \Rightarrow x > -1$

$\left. \begin{array}{l} \oplus \rightarrow \checkmark \\ \ominus \rightarrow \alpha \\ \ominus \rightarrow \alpha \end{array} \right\} x \in (-1, +\infty)$

$y = \frac{1}{\sqrt{x+1}x} \Rightarrow \sqrt{x+1}x > 0 \Rightarrow x+1 > 0 \Rightarrow x > -1$

$\left. \begin{array}{l} \oplus \rightarrow \checkmark \\ \ominus \rightarrow \alpha \\ \ominus \rightarrow \alpha \end{array} \right\} x \in (-1, +\infty)$

$y = \sqrt{2 - [x]} \Rightarrow \sqrt{2 - [x]} \geq 0 \Rightarrow 2 - [x] \geq 0 \Rightarrow x \in (-\infty, 2)$

$y = \sqrt{2 - [x]} \Rightarrow \sqrt{2 - [x]} > 0 \Rightarrow 2 - [x] > 0 \Rightarrow x \in (-\infty, 2)$

الف) $y = \sqrt{[x - \frac{1}{n}] + [x + \frac{2}{n}]} \Rightarrow [x - \frac{1}{n}] \geq 0 \Rightarrow x - \frac{1}{n} \geq 0 \Rightarrow x \in [\frac{1}{n}, +\infty)$

$[x - \frac{1}{n}] + [x + \frac{2}{n}] \geq 0 \Rightarrow x + \frac{2}{n} = x - \frac{1}{n} + 1 \Rightarrow [x + \frac{2}{n}] = [x - \frac{1}{n}] + 1$

ب) $y = \sqrt{[x - \frac{1}{n}] + [x + \frac{2}{n}]} \Rightarrow \begin{cases} 0 & x - \frac{1}{n} \in \mathbb{Z} \\ -1 & x - \frac{1}{n} \notin \mathbb{Z} \end{cases} \Rightarrow x - \frac{1}{n} \in \mathbb{Z} \Rightarrow x \in \{\frac{1}{n} + n/\mathbb{Z}\}$

$y = \frac{2}{\sin x - 1} \Rightarrow x \in \mathbb{R} - \{k\pi + \frac{\pi}{2}\}$

$y = \frac{3}{2\sin^2 x - 1} \Rightarrow 2\sin^2 x \neq 1$

$\sin x \neq \pm \frac{\sqrt{2}}{2} \Rightarrow x \in \mathbb{R} - \{k\pi + \frac{\pi}{4}, k\pi + \frac{3\pi}{4}\}$

$$y = \sqrt{2 \sin x - 1} \geq 0 \Rightarrow 2 \sin x - 1 \geq 0 \Rightarrow \sin x \geq \frac{1}{2} \Rightarrow x \in \left[\frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi \right]$$

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$$y = \sqrt{\cos x - 1} \geq 0 \Rightarrow x \in \{2k\pi, k\pi\}$$

$$\cos y = |x| - 2 \Rightarrow -1 \leq |x| - 2 \leq 1$$

$$2 \leq |x| \leq 4 \Rightarrow x \in [-4, -2] \cup [2, 4]$$

$$\Rightarrow x \in [-2, -1] \cup [-1, 0]$$

$$y = \arcsin(x^2 - 2x + 1) \Rightarrow x^2 - 2x + 1 \geq -1 \quad x \leq -2 \quad x^2 - 2x + 1 \leq 1$$

$$\Rightarrow x \geq -1 \quad x \geq -1 \quad x^2 - 2x + 1 \leq 0$$

$$\Rightarrow x(x-2) \leq 0 \quad \Rightarrow x \in [0, 2]$$

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$$\text{الف) } y = \sqrt{2 - \log_2(x-2)} \geq 0 \Rightarrow 2 - \log_2(x-2) \geq 0 \Rightarrow \log_2(x-2) \leq 2 \Rightarrow x-2 \leq 4 \Rightarrow x \leq 6$$

$$\Rightarrow x > 2 \Rightarrow x \in (2, 6]$$

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$$\text{ب) } y = \log(x^2 - x) \Rightarrow x(x-1) > 0 \Rightarrow x \in (-1, 0) \cup (1, \infty)$$

$$\Rightarrow x \neq -1, 0, 1$$

$$\text{الف) } \frac{x}{x^2 + 1} \Rightarrow f'(x) > 0 \Rightarrow x \in \mathbb{R}$$

$$\text{ب) } \frac{x}{x^2 - 1} \Rightarrow x \in \mathbb{R} - \{0\}$$

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$$\text{ج) } \frac{x}{x^2 - 2} \Rightarrow f'(x) > 0 \Rightarrow x \in \mathbb{R} - \{\pm\sqrt{2}\}$$

$$\text{د) } \frac{x}{x^2 - 2} \Rightarrow x \in \mathbb{R} \cdot \{\log_2 2\}$$

$$y = (x^2 + 1)! \Rightarrow x^2 + 1 \geq 0 \Rightarrow x \in \mathbb{R}$$

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$$y = \left(\frac{x^2 - 2}{x^2 - 1} \right)! \Rightarrow \frac{x^2 - 2}{x^2 - 1} \geq 0 \Rightarrow x \in (-\infty, -\sqrt{2}] \cup [\sqrt{2}, \infty)$$