

$$1) \frac{x^2 - 4x}{x^2 - x} \geq 0 \rightarrow \frac{x(x-4)}{x(x+1)(x-1)} \rightarrow \frac{-1}{-} \frac{0}{+} \frac{1}{+} \frac{4}{-} \rightarrow D_f = (-1, 1) \cup [4, +\infty) - \{0\}$$

$$2) \frac{x^3 - x^2}{x^2 - x} \geq 0 \rightarrow \frac{x^2(x-1)}{x(x^2-1)} \rightarrow \frac{x^2(x-1)(x+1)}{x(x-1)(x+1)} \rightarrow \frac{-1}{+} \frac{0}{+} \frac{1}{+} \rightarrow D_f = \mathbb{R} - \{-1, 0, 1\}$$

$$1) \frac{x+1}{\sqrt{x+|x|}} \rightarrow x+|x| > 0 \rightarrow \oplus \oplus \oplus \rightarrow D_f = \mathbb{R}^+$$

$$2) \frac{1}{\sqrt{x|x|}} \rightarrow x|x| > 0 \rightarrow \oplus \ominus \oplus \rightarrow D_f = \mathbb{R}^+$$

$$1) \sqrt{y-[x]} \rightarrow y-[x] \geq 0 \rightarrow [x] \leq y \rightarrow D_f = (-\infty, y)$$

$$2) \frac{1}{\sqrt{y-[x]}} \rightarrow y-[x] > 0 \rightarrow [x] < y \rightarrow D_f = (-\infty, y)$$

$$1) [x - \frac{1}{y}] + [x + \frac{y}{y}] \rightarrow [x - 1 + \frac{y}{y}] + [x + \frac{y}{y}] \geq 1 \rightarrow y[x + \frac{y}{y}] \geq 1 \rightarrow [x + \frac{y}{y}] \geq \frac{1}{y}$$

$$D_f: [\frac{1}{y}] \rightarrow x \geq \frac{1}{y} \leftarrow x + \frac{y}{y} \geq 1$$

$$2) [x - \frac{1}{y}] + [-x + \frac{1}{y}] \geq 0 \rightarrow [x] + [-x] \geq 0 \rightarrow D_f = \mathbb{Z} + \frac{1}{y}$$

$$D_f = \mathbb{Z}$$

$$1) \sin x - 1 \rightarrow \sin x \neq 1 \rightarrow D_f = \mathbb{R} - \{x | k\pi + \frac{\pi}{2}\}$$

$$2) y \sin^2 x - 1 \neq 0 \rightarrow y \sin^2 x \neq 1 \rightarrow \sin^2 x \neq \frac{1}{y} \rightarrow \sin x \neq \pm \sqrt{\frac{1}{y}} \rightarrow D_f = \mathbb{R} - \{\frac{k\pi}{y} + \frac{\pi}{2}\}$$

$$\text{الف) } \sqrt{r \sin x - 1} \rightarrow r \sin x - 1 \geq 0 \rightarrow r \sin x \geq 1 \rightarrow \sin x \geq \frac{1}{r} \rightarrow D_f = \left[\frac{1}{r} \cdot \frac{\pi}{2}, \frac{1}{r} \cdot \frac{3\pi}{2} \right]$$

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$$\text{ب) } \sqrt{\cos x - 1} \rightarrow \cos x - 1 \geq 0 \rightarrow \cos x \geq 1 \rightarrow D_f = \{2k\pi\}$$

$$\text{الف) } \cos y = |x| - r \rightarrow -1 \leq |x| - r \leq 1 \rightarrow r \leq |x| \leq r+1 \rightarrow D_f = [r, r+1] \cup [-r-1, -r]$$

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$$\text{ب) } y = a r \cosh(x^r + r x + 1) \rightarrow -1 \leq x^r + r x + 1 \leq 1 \rightarrow [-r - r] \cup [-1, 0]$$

$$-r \leq x \leq 0 \leftarrow x(x+r) \rightarrow x^r + r x + 1 \rightarrow -1 \rightarrow -r \rightarrow -\frac{r}{2} \rightarrow x \leq -r \quad x \geq -1$$

$$\text{الف) } \sqrt{r - \log_r(x-r)} \rightarrow r - \log_r(x-r) \geq 0 \rightarrow \log_r(x-r) \leq r \rightarrow x-r \leq r \rightarrow x \leq 11$$

$$D_f = (-\infty, 11]$$

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$$\text{ب) } \log(x^r - x) \rightarrow x^r - x > 0 \rightarrow x^r > x \rightarrow \begin{matrix} \ominus & \oplus & \ominus \\ \oplus & \oplus & \oplus \end{matrix} \rightarrow D_f = \mathbb{R}^+ \setminus (0, +\infty)$$

$$\text{الف) } y = \frac{r}{\varepsilon^x + 1} \rightarrow \varepsilon^x + 1 \neq 0 \rightarrow \varepsilon^x \neq -1 \rightarrow D_f = \mathbb{R}$$

$$\text{ب) } \frac{r}{\varepsilon^x - 1} \rightarrow \varepsilon^x - 1 \neq 0 \rightarrow \varepsilon^x \neq 1 \rightarrow x \neq 0 \rightarrow D_f = \mathbb{R} - \{0\}$$

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$$\text{ج) } \frac{r}{\varepsilon^x - r} \rightarrow \varepsilon^x - r \neq 0 \rightarrow \varepsilon^x \neq r \rightarrow x \neq \frac{1}{r} \rightarrow D_f = \mathbb{R} - \{\frac{1}{r}\}$$

$$\text{د) } \frac{r}{\varepsilon^x - r} \rightarrow \varepsilon^x - r \neq 0 \rightarrow \varepsilon^x \neq r \rightarrow x \neq \log_r r \rightarrow D_f = \mathbb{R} - \{\log_r r\}$$

$$\text{الف) } (k+1)! \rightarrow k+1 \in \mathbb{N} \rightarrow k \in \mathbb{N} + 1 \rightarrow x \in \frac{n+1}{r} \rightarrow D_f = \{x/k : \frac{k+1}{r} \in \mathbb{N}\}$$

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$$\text{ب) } \frac{x^2 - r}{x^2 - d} \in \mathbb{N} \rightarrow x \in \frac{-d \sqrt{r+1} + r}{r \sqrt{r+1}} \rightarrow x \in \frac{d \sqrt{r+1} - r}{r \sqrt{r+1}} \rightarrow D_f = \{x/k : \frac{k^2 - r}{k^2 + r} \in \mathbb{N}\}$$

$$k \neq 0 \rightarrow x \neq d$$