

الف) $y = \frac{x^2 - 2x}{x^3 - x}$ $\frac{x(x-2)}{x(x^2-1)} = \frac{x-2}{x^2-1} \geq 0$ $x \neq 0$
 $x = 1, -1$

ب) $y = \frac{x^3 - x^2}{x^3 - x}$ $\frac{x^2(x-1)}{x(x^2-1)} = \frac{x^2}{x^2-1} \geq 0$ $x = 2$
 $(-1, 1) \cup [2, +\infty)$ $x^2 \geq 0$
 $\mathbb{R} - \{0, 1, -1\}$

الف) $y = \frac{x+1}{\sqrt{x+|x|}}$ $x+|x| > 0$ $2x > 0 \Rightarrow x > 0 \Leftrightarrow x \geq 0$
 $x+(-x) = 0 \Leftrightarrow x < 0$
 $(0, +\infty)$

ب) $y = \frac{1}{\sqrt{x|x|}}$

$x|x| > 0$ $D_f = (0, +\infty)$

$y = \sqrt{2 - [x]}$ $x < 2$ $(-\infty, 2)$

$2 - [x] \geq 0 \Rightarrow [x] \leq 2$

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

$2 - [x] > 0 \Rightarrow [x] < 2$

$y = \sqrt{\left[x - \frac{1}{3}\right] + \left[x + \frac{2}{3}\right]}$ $[2x] \geq 0 \Rightarrow 2x \geq 0 \Rightarrow x \geq 0$
 $[0, +\infty)$

$y = \sqrt{\left[x - \frac{1}{3}\right] + \left[x + \frac{1}{3}\right]}$ این عبارت همیشه ۱ است

$D_f = \{x | x = k + \frac{1}{3}, k \in \mathbb{Z}\}$

الف) $y = \frac{2}{\sin x - 1}$ $\sin x - 1 \neq 0 \Rightarrow \sin x \neq 1$
 $\mathbb{R} - \{\frac{\pi}{2} + 2k\pi\}$

ب) $y = \frac{2}{2\sin^2 x - 1}$ $2\sin^2 x - 1 \neq 0 \Rightarrow \sin^2 x \neq \frac{1}{2}$
 $\sin x \neq \pm \frac{\sqrt{2}}{2}$ $\mathbb{R} - \{k\pi \pm \frac{\pi}{4}\}$

$$y = \sqrt{y \sin x - 1} \Rightarrow y \sin x - 1 \geq 0 \Rightarrow \sin x \geq \frac{1}{y}$$

$$D_f = \left[yk\pi + \frac{\pi}{2}, yk\pi + \frac{3\pi}{2} \right]$$

$$y = \sqrt{\cos x - 1} \quad D_f = \{ yk\pi \}$$

$$\cos x - 1 \geq 0 \Rightarrow \cos x \geq 1$$

$$\cos y = |x| - 3 \quad x \in [-4, -2] \cup [2, 4]$$

$$-1 \leq |x| - 3 \leq 1 \Rightarrow 2 \leq |x| \leq 4$$

$$y = \arcsin(x^2 + 3x + 1) \quad x^2 + 3x + 1 \geq -1 \quad x(x+4) \leq 0$$

$$-1 \leq x^2 + 3x + 1 \leq 1 \quad x^2 + 3x + 2 \geq 0 \quad D_f = [-2, -1] \cup [-1, 0]$$

$$(x+1)(x+2) \geq 0$$

$$y = \sqrt{2 - \log_2(x-2)} \quad 2 - \log_2(x-2) \geq 0 \quad x-2 \leq 9 \Rightarrow x \leq 11$$

$$x-2 > 0 \Rightarrow x > 2 \quad \log_2(x-2) \leq 2 \quad 2 \leq x \leq 11$$

$$y = \log(x^3 - x) \quad (-1, 0) \cup (1, \infty)$$

$$x^3 - x > 0 \Rightarrow x(x-1)(x+1) > 0$$

$$y = \frac{r}{r^x + 1}$$

$$y = \frac{r}{r^x - 1}$$

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$$r^x - 1 \neq 0 \Rightarrow r^x \neq 1$$

$$x \neq 0 \quad \mathbb{R} - \{0\}$$

$$y = \frac{r}{r^x - 2}$$

$$r^x - 2 \neq 0$$

$$r^x \neq 2$$

$$x \neq \log_r 2$$

$$x \neq 1, 2$$

$$\mathbb{R} - \{1, 2\}$$

$$y = \frac{r}{r^x - r}$$

$$r^x - r \neq 0 \Rightarrow r^x \neq r$$

$$\Rightarrow x \neq \log_r r$$

$$\mathbb{R} - \{\log_r r\}$$

$$y = (x+1)!$$

$$x+1 \in \mathbb{N}$$

$$x \in \mathbb{N} - 1$$

$$D_f = \left\{ x \mid x = \frac{k-1}{r}, k \in \mathbb{N} \right\}$$

$$y = \left(\frac{rx-y}{rx-a} \right)!$$

$$\frac{rx-y}{rx-a} \in \mathbb{N}$$

$$rx-y \in \mathbb{N} \quad rx-a \in \mathbb{N}$$

$$rx-y \in \mathbb{N} \quad rx-a \in \mathbb{N}$$

$$x \in \frac{r-a}{r-y}$$