

الف) $y = \frac{x+r}{r^2x^2 - r_0x^r + r(x-1)} = \frac{x+r}{(x-1)(r^2x^r - 1)(x+1)} = (x-1)(r^2x^r - 1)(x+1) \neq 0 \Rightarrow$
 $D_f = \mathbb{R} - \{1, \frac{r}{r}, \frac{r}{r}\}$

ب) $y = \frac{x+r}{r^2x^2 - x^r - 1} = \frac{x+r}{(x+1)(r^2x^r - 1)(x-r)} \Rightarrow D_f = \mathbb{R} - \{-1, r, -\frac{r}{r}\}$
 $r^2x^r - 1 = 0 \Rightarrow x^r - 1 = 0 \Rightarrow (x-1)(x+r) = 0$
 $x = \frac{r}{r} = r, x = -\frac{r}{r}$

ج) $y = \frac{x+1}{x - \sqrt{r-rx}} \rightarrow r-rx \geq 0 \Rightarrow r \geq rx \Rightarrow \frac{r}{r} \geq x \Rightarrow D_f = (-\infty, \frac{r}{r}] - \{1\}$
 $x - \sqrt{r-rx} \neq 0 \Rightarrow x \neq \sqrt{r-rx} \Rightarrow x^2 \neq r-rx \Rightarrow x^2 + rx - r \neq 0$
 $(x-1)(x+r) \neq 0 \Rightarrow x \neq 1, x \neq -r$

د) $y = \frac{x+r}{x - \sqrt{rx-r}} \rightarrow rx-r \geq 0 \Rightarrow rx \geq r \Rightarrow x \geq \frac{r}{r} \Rightarrow D_f = [\frac{r}{r}, +\infty) - \{1, r\}$
 $x - \sqrt{rx-r} \neq 0 \Rightarrow x \neq \sqrt{rx-r} \Rightarrow x^2 \neq rx-r \Rightarrow x^2 - rx + r \neq 0$
 $(x-r)(x-1) \neq 0 \Rightarrow x \neq r, x \neq 1$

ه) $y = \frac{\sin x}{r \cos x - 1} = r \cos x \neq 1 \Rightarrow \cos x \neq \frac{1}{r} \Rightarrow D_f = \mathbb{R} - \{r k \pi \pm \frac{\pi}{r}\}$

و) $y = \frac{\cos x + 1}{r \sin x + 1} = r \sin x \neq -1 \Rightarrow \sin x \neq -\frac{1}{r} \Rightarrow D_f = \mathbb{R} - \{r k \pi - \frac{\pi}{r}, r k \pi + \pi + \frac{\pi}{r}\}$

ز) $y = \frac{\tan x + r}{\cot x - 1} = \begin{cases} \tan x \neq 0 \rightarrow \mathbb{R} - \{r k \pi \pm \frac{\pi}{r}\} \\ \cot x \neq 0 \rightarrow \mathbb{R} - \{k \pi\} \\ \cot x - 1 \neq 0 \rightarrow \cot x \neq 1 \rightarrow \mathbb{R} - \{k \pi + \frac{\pi}{r}\} \end{cases} \Rightarrow D_f = \mathbb{R} - \{\frac{k \pi}{r}, k \pi + \frac{\pi}{r}\}$

ح) $y = \frac{\sin x + 1}{r \sin x - r} = r \sin x \neq r \Rightarrow \sin x \neq \frac{r}{r} \Rightarrow \sin x \neq \pm \frac{\sqrt{r}}{r} \Rightarrow D_f = \mathbb{R} - \{k \pi \pm \frac{\pi}{r}\}$

$$a) x^r - a x + r > 0 \rightarrow (x-r)(x-r) > 0 \quad \frac{r}{+b-b+} \rightarrow D_f = (-\infty, r) \cup (r, +\infty)$$

$$b) x^r - r x + a < 0 \rightarrow (x-a)(x-r) < 0 \quad \frac{1}{+b-b+} \rightarrow D_f = (1, a)$$

$$c) x^r + r x + a \rightarrow (x+a)(x+1) \geq 0 \quad \frac{-a-1}{+b-b+} \rightarrow D_f = (-\infty, -a] \cup [-1, +\infty)$$

$$d) x^r - r x + r \leq 0 \rightarrow (x-r)(x-1) \leq 0 \quad \frac{1}{+b-b+} \rightarrow D_f = [1, r]$$

$$a) \frac{x^r - r x + r}{x-a} < 0 \rightarrow \frac{(x-r)(x-1)}{x-a} < 0 \quad \frac{1}{-b-b+} \rightarrow D_f = (-\infty, a) \cup (r, a)$$

$$b) \frac{x^r - 1}{x^r - r x + a} > 0 \rightarrow \frac{(x+1)(x-1)}{(x-a)(x-1)} > 0 \quad \frac{1}{+b-b+} \rightarrow D_f = (-\infty, a] \cup (a, +\infty)$$

$$a) y = \sqrt{\frac{x^r - r x + r}{x^r - 1}} \rightarrow \frac{(x-r)(x-1)}{(x-1)(x^r + x + 1)} \geq 0 \quad \frac{r}{-b-b+} \rightarrow D_f = [r, +\infty)$$

$$b) \sqrt{\frac{x^r - r x + r}{x^r - 1}} \rightarrow x^r - 1 \neq 0 \rightarrow (x+1)(x-1) \neq 0 \rightarrow x \neq \pm 1 \rightarrow D_f = \mathbb{R} - \{\pm 1\}$$

$$a) y = \log(x^r - r x) \rightarrow x^r - r x > 0 \rightarrow x(x-r) > 0 \quad \frac{r}{+b-b+} \rightarrow D_f = (-\infty, 0) \cup (r, +\infty)$$

~~$y = \log \frac{x^r - r x}{x^r - 1} \rightarrow \frac{x^r - r x}{x^r - 1} > 0 \rightarrow \frac{x(x-r)}{(x-1)(x+1)} > 0$~~

$$b) y = \log \frac{x^r - r x}{x^r + 1} \rightarrow \begin{cases} x^r - r x > 0 \rightarrow (x-r)(x) > 0 \\ |x| - r > 0 \rightarrow |x| > r \rightarrow x > r \vee x < -r \\ |x| - r \neq 1 \rightarrow |x| \neq r+1 \rightarrow x \neq \pm(r+1) \end{cases} \rightarrow D_f = (-\infty, -r) \cup (r, \infty) - \{\pm(r+1)\}$$

$$c) y = \log \frac{x^r - r x + 1}{x-r} \rightarrow \frac{x^r - r x + 1}{x-r} > 0 \rightarrow \frac{(x-r)(x-r)}{x-r} > 0 \rightarrow x-r > 0 \rightarrow x > r$$

$y = \sqrt{x^2 - 11x + 21} + \log_{\frac{\sqrt{2x-x^2}}{x}}$
 $\rightarrow x^2 - 11x + 21 > 0 \rightarrow (x-3)(x-7) > 0 \rightarrow \frac{3}{+} \frac{7}{-}$
 $\rightarrow \sqrt{2x-x^2} > 0 \rightarrow 2x - x^2 > 0 \rightarrow (2-x)(2+x) > 0 \rightarrow \frac{-2}{-} \frac{2}{+}$
 $\rightarrow x > 0, x \neq 1$

$\rightarrow D_f = (0, 3] \cup (7, +\infty)$

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

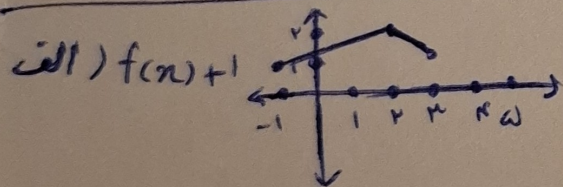
	-1	0	1
$x^2 - x$	+	+	-
$x^2 + x$	+	+	+
y	+	+	-

$y = \frac{x(x-1)}{x(x+1)}$

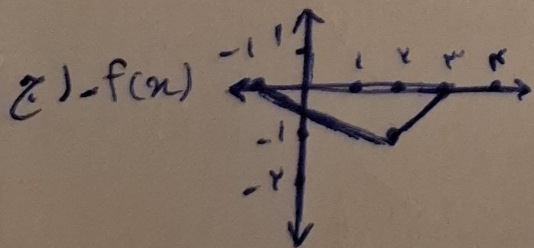
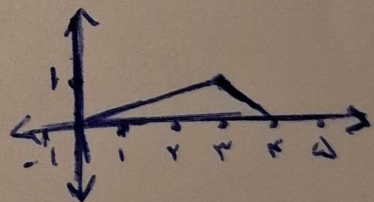
$y = \frac{x(x-1)}{x(x+1)}$

$y = \sqrt{\frac{x-f(x)}{f(x)}} \quad \frac{x-f(x)}{f(x)} > 0$
 $\rightarrow x-f(x) = 0 \rightarrow x = f(x) \rightarrow x = 2, -1$
 $\rightarrow f(x) = 0 \rightarrow x = 2, -2$

$D_f = (-\infty, 2) \cup (-1, 2) \cup (2, +\infty)$



ب) $f(x-1)$



د) $f(x+1) + 1$

