

الف) $f(x) = \sqrt{\frac{x-1}{x}} - \frac{x}{x-1} = \sqrt{\frac{(x-1)^2 - x^2}{x(x-1)}} = \sqrt{\frac{(x-1-x)(x-1+x)}{x(x-1)}} = \sqrt{\frac{1-x}{x(x-1)}} \geq 0$

$D_f: (-\infty, 0) \cup (\frac{1}{x}, 1]$

ب) $\frac{\frac{1}{x+1} - \frac{1}{x}}{\frac{x}{x-1} + \frac{1}{x+2}} = \frac{x-2x-x}{x(x+1)} = \frac{-2-x}{x(x+1)} \neq 0$

$\begin{cases} x(x+1) \neq 0 \rightarrow x \neq 0, x \neq -1 \\ x+2 \neq 0 \rightarrow x \neq -2 \\ (x-1)(x+2) \neq 0 \rightarrow x \neq 1, x \neq -2 \end{cases}$

$D_f: \mathbb{R} - \{-2, 1, -1, 0, -\frac{2}{x}\}$

الف) $f(x) = \sqrt{(\frac{1}{x})^x - 9} (3x - 4x) \geq 0$

$(\frac{1}{x})^x = 9 \rightarrow x = -2$

$3x = 4x \rightarrow x = 0$

$D_f: (-\infty, -2] \cup [\frac{4}{3}, +\infty)$

ب) $\sqrt{x-1} + \sqrt{y+1} = 3$

$\sqrt{x-1} \geq 0 \rightarrow x \geq 1 : I$

$\sqrt{y+1} = 3 - \sqrt{x-1} \geq 0 \rightarrow -\sqrt{x-1} + 3 \geq 0$

$\rightarrow -\sqrt{x-1} \geq -3 \rightarrow \sqrt{x-1} \leq 3 \rightarrow x-1 \leq 9 \rightarrow x \leq 10$

$D_f: I \cap II: [1, 10]$

$f(x) = \log_{\frac{1}{x}} \frac{x^2 - x - 2}{\sqrt{x^2 - 1} + 1} > 0$

$\begin{cases} x^2 - x - 2 > 0 \\ (x-2)(x+1) > 0 \end{cases}$

$I: (-\infty, -1) \cup (2, +\infty)$

$\begin{cases} \sqrt{x^2 - 1} \geq 0 \\ (x-1)(x+1) \geq 0 \end{cases}$

$II: (-\infty, -1] \cup [1, +\infty)$

$\sqrt{x^2 - 1} \neq -1$

$D_f: I \cap II: (-\infty, -1) \cup (2, +\infty)$

$\sqrt{-x^2 + ax + 3} \geq 0 \quad D_f: [-r, b]$

$a+b = \frac{1}{r} + \frac{r}{r} = 1$

$x = -r \rightarrow -r - ra + 3 = 0 \rightarrow a = \frac{-1}{r}$

$\rightarrow -x^2 - \frac{1}{r}x + 3 \geq 0 \quad \Delta = b^2 - 4ac \rightarrow \Delta = \frac{1}{r^2} - 4(-1)(3) = \frac{61}{r^2}$

$x = \frac{-b \pm \sqrt{\Delta}}{2a} \rightarrow x = \frac{\frac{1}{r} \pm \frac{\sqrt{61}}{r}}{-2} = \begin{cases} x_1 = \frac{1 - \sqrt{61}}{-2r} \\ x_2 = \frac{1 + \sqrt{61}}{-2r} \end{cases} \rightarrow b = x_2 = \frac{1 + \sqrt{61}}{-2r}$

$f(x) + f(\frac{1}{x}) = \frac{rx^2 - 12x + 3}{x} \xrightarrow{x=-1} f(-1) = \frac{r + 12 + 3}{-1} = -15 \rightarrow f(-1) = -9$

$f(x) = ax + b \rightarrow ax + \frac{a}{x} + rb = rx^2 - 12x + \frac{3}{x} \Rightarrow \begin{cases} a = r \\ b = -4 \end{cases}$

$f(x) = rx - 4$

$f(-1) = -r - 4 = -9$

$$f(x) = \begin{cases} (a+1)(x+r) & ; x > 1 \\ ra + rx & ; x \leq 1 \end{cases}$$

$$a_2 = \frac{-9}{2}$$

$$A' = \gamma - \cancel{\gamma} + \gamma + \cancel{\gamma} + \gamma$$

$A = 4 \text{ 00}$

$$A = \pm \sqrt{4}$$

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$$f(-) = \frac{r_{m-1}}{r} \xrightarrow{m \rightarrow \infty} f(-) = \frac{r_v}{r} - \frac{r}{r} = \frac{r_d}{r}$$

$$\begin{array}{c|c} & 1 \\ \hline x & \begin{array}{l} x + x - x \\ = x + x \end{array} \\ y & \begin{array}{l} x + x - x \\ = x + x - x \end{array} \\ z & \begin{array}{l} x + x - x \\ = x + x - x \end{array} \end{array}$$

$$f(x) = \begin{cases} 3x - 2 & ; x \geq 1 \\ 2x + 3 & ; x < 1 \end{cases}$$