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طرحه محدودا عمار - يادهم پسر - تلفيع

$$\sqrt{\frac{x-1}{x} + \frac{-x}{x-1}} \rightarrow \frac{x-1}{x} + \frac{-x}{x-1} \geq 0 \rightarrow \frac{-x^2+1}{x^2-x} \geq 0$$

$$\frac{x^2-1}{x(x-1)} \leq 0$$

$$\begin{array}{c|c|c|c} & 0 & \frac{1}{x} & 1 \\ \hline - & + & - & + \\ \hline 0 & 0 & 0 & 0 \end{array}$$

$$Df = (-\infty, 0) \cup [\frac{1}{x}, 1) \quad \checkmark$$

$$\frac{1}{x+1} - \frac{r}{x} \rightarrow \frac{r}{x-1} + \frac{1}{x+2} \neq 0$$

$$\frac{r}{x-1} + \frac{1}{x+2} \rightarrow \frac{rx+4+x-1}{x^2+x-2} = \frac{rx+3}{x^2+x-2} \neq 0 \rightarrow x \neq \frac{-3}{r}$$

$$\Rightarrow Df = \mathbb{R} - \left\{ -r, -1, \frac{-3}{r}, 0, 1 \right\} \quad \checkmark$$

$$\sqrt{\left(\left(\frac{1}{r}\right)^x - 9\right)(rx - r^x)} \rightarrow \left(\left(\frac{1}{r}\right)^x - 9\right)(rx - r^x) \geq 0 \rightarrow \frac{\infty}{r}, -r$$

$$\begin{array}{c|c|c|c} & -r & r/\infty & \\ \hline \left(\frac{1}{r}\right)^x - 9 & + & - & - \\ \hline rx - r^x & + & + & - \\ \hline & + & - & + \\ \hline 0 & 0 & 0 & 0 \end{array}$$

$$\rightarrow Df = (-\infty, -r] \cup \left[\frac{\infty}{r}, +\infty\right) \quad \checkmark$$

$$\sqrt{x-1} + \sqrt{y+1} = r \rightarrow \sqrt{y+1} = r - \sqrt{x-1}$$

$$\begin{cases} x-1 \geq 0 \rightarrow x \geq 1 \\ r - \sqrt{x-1} \geq 0 \rightarrow x-1 \leq r^2 \rightarrow x \leq r^2+1 \end{cases}$$

$$Df = [1, r^2+1] \quad \checkmark$$

$$f(x) = \frac{\log(x^r - x - r)}{\sqrt{x^r - 1} + 1} \xrightarrow{I} x^r - x - r > 0 \rightarrow (x-r)(x+1) > 0$$

$$\begin{array}{c|c|c|c} & -1 & r & \\ \hline + & - & + & \\ \hline & + & - & + \\ \hline 0 & 0 & 0 & 0 \end{array} \rightarrow (-\infty, -1) \cup (r, +\infty)$$

$$I \cap II \cap III = (-\infty, -1) \cup (r, +\infty) \quad \checkmark$$

Parsian $II - x^r - 1 \geq 0 \rightarrow x^r \geq 1 \rightarrow (-\infty, -1] \cup [1, +\infty)$

$$III \sqrt{x^r - 1} + 1 \neq 0 \rightarrow \sqrt{x^r - 1} \neq -1 \rightarrow \mathbb{R}$$

$$y = \sqrt{r+ax-x^r} \rightarrow -x^r+ax+r \geq 0 \xrightarrow{x=r} -r-ra+r=0 \rightarrow -1=ra \rightarrow \frac{-1}{r}=a \quad \checkmark$$

$$a = -\frac{1}{r} \rightarrow -x^r - \frac{1}{r}x + r \rightarrow x=r \rightarrow y=0 \quad \left\{ \begin{array}{l} -r \\ r \\ r \end{array} \right. = b \quad (1, \infty)$$

$$Df = [-r, r] \rightarrow b=r, a=-\frac{1}{r} \rightarrow a+b = \checkmark 1$$

$$f(x) \begin{cases} rx-r & x \geq 1 \\ rx+r & x < 1 \end{cases}, \sqrt{f(x)-x} \rightarrow x \geq 1 \rightarrow rx-r-x = rx-r \geq 0 \quad \checkmark$$

$$\rightarrow x < 1 \rightarrow rx+r-x = x+r \geq 0 \quad \checkmark$$

$$Df = \text{In } \text{II} \rightarrow x \geq 1 = [r, +\infty) \quad \checkmark$$

$$f(x) \begin{cases} (a+1)(x+r) & x > 1 \\ ra+rx & x \leq 1 \end{cases} \rightarrow rf(a) = f(-r)+a \quad \checkmark$$

$$r(va+v) = ra - \varepsilon + a = fa - \varepsilon$$

$$1 \cdot a = -1 \rightarrow a = \frac{-1}{1} = -1 \quad \checkmark$$

$$f(x) = \sqrt{x} + \frac{1}{\sqrt{x}} + r = f(x) = \sqrt{x + \frac{1}{x}} + r + r = (r+\sqrt{x})(r-\sqrt{x}) = 1 \quad \checkmark$$

$$\rightarrow f(r+\sqrt{r}) + f(r-\sqrt{r}) = rf(r+\sqrt{r}) \quad \checkmark$$

$$f(r+\sqrt{r}) = \sqrt{r+\sqrt{r}} + \frac{1}{\sqrt{r+\sqrt{r}}} + r + r = r + \sqrt{r}$$

$$rf(r+\sqrt{r}) = r(r+\sqrt{r}) = r + r\sqrt{r} \quad \checkmark$$

$$\left. \begin{aligned} 2f(x) - 3f(-x) &= 4x^2 - x \\ 2f(x) - 3f(x) &= 4x^2 + x \end{aligned} \right\} \begin{aligned} x^2 \quad f(x) - 4f(-x) &= 12x^2 - 2x \\ x^2 \quad 4f(-x) - 9f(x) &= 12x^2 + 3x \end{aligned} \right\} \begin{aligned} -\Delta \\ -2f(x) &= 2x^2 + x \end{aligned} \quad (2)$$

$$\Rightarrow f(x) = -x^2 - \frac{1}{2}x \quad \checkmark$$

$$(x+r)f(x) - 3xf(x+r) = 4x^2 - mx + 3m - 1 \quad -a$$

$$\left. \begin{aligned} x=0 &\rightarrow 2f(0) = 3m - 1 \xrightarrow{x^2} 4f(0) = 9m - 1 \\ x=-r &\rightarrow 4f(0) = 14 + 3m + 3m - 1 = 2m + 12 \end{aligned} \right\} \begin{aligned} 3m &= 12 \\ m &= 4 \end{aligned} \quad (2)$$

$$4f(0) = 22/2 + 12 = 34/2 \rightarrow f(0) = 4/2 = \frac{2}{1} \quad \checkmark$$

$$f(x) + f\left(\frac{1}{x}\right) = \frac{4x^2 - 12x + 2}{x} \quad (2) \quad -1.$$

$$x=-1 \rightarrow f(-1) + f(-1) = 2f(-1) = \frac{4+12+2}{-1} = -18 \rightarrow f(-1) = -9 \quad \checkmark$$