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$$x^r f(x+1) \geq 0 \quad f(x+1) = \left(\frac{1}{x}\right)^{x-1} - 1 \Rightarrow \begin{cases} x > 1 & \text{منفی} \\ x = 1 & \text{صفر} \\ x < 1 & \text{مثبت} \end{cases}$$

$$x > 0 \rightarrow x^r > 0 \rightarrow f(x+1) \geq 0 \rightarrow x \leq 1 \rightarrow 0 \leq x \leq 1$$

$$x = 0 \rightarrow \text{صورت منفرجه}$$

$$\rightarrow D = [0, 1]$$

$$x < 0 \rightarrow x^r < 0 \rightarrow f(x+1) \leq 0 \quad x$$

$$x + |x+2| \geq 0 \quad f(-x) = \sqrt{-x+|2-x+2|} \Rightarrow -x + |2-x+2| \geq 0$$

$$-x+2 \geq 0 \rightarrow x \leq 2 \rightarrow | -x+2 | = -x+2 \Rightarrow -x -x+2 \geq 0 \rightarrow -2x+2 \geq 0 \rightarrow x \leq 1 \quad \checkmark$$

$$-x+2 < 0 \rightarrow x > 2 \rightarrow | -x+2 | = x-2 \Rightarrow -x+x-2 \geq 0 \rightarrow -2 \geq 0 \quad x$$

$$D = (-\infty, 1]$$

$$f(x) \neq 0 \quad \frac{x-1}{f(x)} \geq 0 \quad x \neq -1 \quad x \neq 1 \quad x \neq 2$$

$$[-1, 1) : f(x) > 0 \quad x-1 < 0 \rightarrow \text{منفی } x$$

$$(-1, 1) : f(x) < 0 \quad x-1 < 0 \rightarrow \text{مثبت } \checkmark \quad x=1 \rightarrow \text{صورت منفرجه} \quad (1, 2) : f(x) < 0 \quad x-1 > 0 \rightarrow \text{منفی } x$$

$$(2, 3) : f(x) > 0 \quad x-1 > 0 \rightarrow \text{مثبت } \checkmark$$

$$\Rightarrow D = (-1, 1] \cup (2, 3)$$

$$9x^5 - 5x^r - 5x - 3 = (3x^r - x - 3)(3x^r + x + 1)$$

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$$\Rightarrow 3x^r + ax + b = 3x^r - x - 3$$

$$a = -1 \quad b = -3$$

$$\sqrt{-(a+b)} = \sqrt{-(-1-3)} = \sqrt{4} = 2$$

$$f\left(\frac{f}{x}\right) = \left(\frac{f}{x}\right)^r + \frac{f}{x} = \frac{f^r}{x^r} + \frac{f}{x} \Rightarrow f(x) - f\left(\frac{f}{x}\right) = x^r + x - \frac{f^r}{x^r} - \frac{f}{x}$$

$$f(x) - f\left(\frac{f}{x}\right) = x^r + x - \frac{f^r}{x^r} - \frac{f}{x} \quad n = x^r \rightarrow n^r + n^r - fn - f^r = (n-f)(n^r + n + 1)$$

$$(n-f)(n^r + n + 1) \geq 0 \rightarrow x^r \geq f \rightarrow |x| \geq 2 \quad x > 0 \rightarrow 0 \leq \text{صورت} \rightarrow |x| \geq 2 \rightarrow x \geq 2 \quad \checkmark$$

$$(n-f)(n^r + n + 1) \leq 0 \rightarrow |x| \leq 2 \quad x < 0 \rightarrow 0 \geq \text{صورت} \rightarrow |x| \leq 2 \rightarrow -2 \leq x < 0 \quad \checkmark$$

$$x = \pm 2 \rightarrow \text{صورت منفرجه}$$

$$f\left(\frac{f}{x}\right) \rightarrow x \neq 0$$

s.a.m

$$D = [-2, 0) \cup [2, +\infty)$$

$$x^r + x = r \rightarrow x = 1 \rightarrow r(1)^r - 1 = 1$$

$$x^r + x = 1 \rightarrow x = r \rightarrow r(r)^r - 1 = r \Rightarrow f(r) + f(1) = 1 + r = 1$$

$$f(x) = x^r + x \rightarrow f(x) = (x-r)^r + 1$$

$$g(x) = x^r + x \rightarrow g(x) = (x+r)^r - r$$

$$g(\sqrt{r} - r) = ((\sqrt{r} - r) + r)^r - r = r - r = -r$$

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

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

$$f(x) + g(x) = \sqrt{x+\epsilon} \sqrt{x-\epsilon} + \sqrt{x-\epsilon} \sqrt{x-\epsilon} = \sqrt{x-\epsilon} + \epsilon \sqrt{x-\epsilon} + \epsilon + \sqrt{x-\epsilon} - \epsilon \sqrt{x-\epsilon} + \epsilon$$

$$\Rightarrow \sqrt{(\sqrt{x-\epsilon} + \epsilon)^2} + \sqrt{(\sqrt{x-\epsilon} - \epsilon)^2} = |\sqrt{x-\epsilon} + \epsilon| + |\sqrt{x-\epsilon} - \epsilon| \quad x \geq \epsilon \rightarrow \text{نیز ابطال می باشد}$$

$$D = [\epsilon, 1) \rightarrow \sqrt{x-\epsilon} + \epsilon - \sqrt{x-\epsilon} + \epsilon - \epsilon = 0$$

$$D = [1, +\infty) \rightarrow \sqrt{x-\epsilon} + \epsilon + \sqrt{x-\epsilon} - \epsilon = 2\sqrt{x-\epsilon} \quad r\sqrt{x-\epsilon} = a + b\sqrt{x-\epsilon} + c$$

$$a=0 \quad b=r \quad c=-\epsilon \quad \frac{a+b}{c} = \frac{0+r}{-\epsilon} = -\frac{1}{\epsilon}$$

$$f(x) = \left\{ \left(0, \frac{r}{\epsilon}\right) \left(1, \frac{r}{\epsilon}\right) \left(r, -\epsilon\right) \left(r, \frac{1}{\epsilon}\right) \right\} \quad g(x) = \left\{ \left(r, 1\right) \left(1, 0\right) \left(r, 0\right) \left(1, \epsilon\right) \right\}$$

$$\frac{g}{f} = \left\{ \left(0, \epsilon\right) \left(r, -\frac{1}{\epsilon}\right) \right\}$$

$$f(rx) = \left\{ \left(\frac{1}{r}, r\right) \left(\frac{r}{r}, -1\right) \left(r, r\right) \left(-\frac{1}{r}, \epsilon\right) \right\}$$

$$f(x^r) = \left\{ \left(1, r\right) \left(-1, r\right) \left(\sqrt{r}, -1\right) \left(-\sqrt{r}, -1\right) \left(r, r\right) \left(-r, r\right) \right\}$$

$$rg'(x) + 1 = \left\{ \left(-r, 1\right) \left(1, r\right) \left(r, 1\right) \left(-1, 1\right) \right\}$$

$$\frac{rf}{g} = \left\{ \left(1, -\epsilon\right) \left(r, -1\right) \left(-1, \frac{1}{\epsilon}\right) \right\}$$