

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

$$\frac{0}{+} \quad \frac{1}{-} \quad \frac{0}{+} \quad \frac{-}{-} \rightarrow (-\infty, 0) \cup [\frac{1}{2}, 1) \checkmark$$

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$$\frac{x-2x-2}{x(x+1)} = \frac{-(x+2)}{x(x+1)} \Rightarrow D_f = \{-2, -\frac{2}{x}, -1, 0, 1\}$$

$$\frac{(x-1)(x+2)}{(x-1)(x+2)} \rightarrow -2 \text{ و } 1$$

$$\left(\frac{1}{x}-2\right)(1-\frac{2}{x}) \geq 0$$

$$\frac{-2}{+} \quad \frac{0}{-} \quad \frac{1}{+} \quad \frac{2}{+}$$

$$D_f = (-\infty, -2] \cup [\frac{2}{x}, +\infty) \checkmark$$

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$$1: x-1 \geq 0 \rightarrow x \geq 1$$

$$2: \sqrt{x+1} = 2 - \sqrt{x-1} \rightarrow \sqrt{x-1} \leq 2 \rightarrow x \leq 12$$

$$\Rightarrow D_f = [1, 12] \checkmark$$

$$1: x^2-1 \geq 0 \rightarrow x \geq 1 \text{ و } x \leq -1$$

$$2: x^2-x-2 > 0 \rightarrow (-\infty, -1) \cup (2, +\infty)$$

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

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$$-x^2+ax+2 \rightarrow p=-2, q=2 \rightarrow \beta = \frac{-r}{-1} = \frac{2}{1} = 2$$

$$\Rightarrow a+b=1 \checkmark$$

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$$x \geq 1 \rightarrow g(x) = \sqrt{2x-2-x} = \sqrt{2x-2} \rightarrow x \geq 1 \rightarrow x \geq 1 \text{ I}$$

$$x < 1 \rightarrow g(x) = \sqrt{2x+2-x} = \sqrt{x+2} \rightarrow x > -2 \rightarrow -2 < x < 1 \text{ II}$$

$$D_g = \text{I} \cup \text{II} = [-2, +\infty) \checkmark$$

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$$f(a) = f(-r) + a$$

$$\rightarrow f(a+1)(r) = ra - r + a \rightarrow 1ra + 1r = ra - r \rightarrow a = -1, \wedge \checkmark$$

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

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

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

$$\sqrt{9} \rightarrow (r\sqrt{9} + r)$$

$$(\sqrt{r + \sqrt{r}} + \sqrt{r - \sqrt{r}})^2 = r + \sqrt{r} + r - \sqrt{r} + 2\sqrt{(r + \sqrt{r})(r - \sqrt{r})} = 9$$

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$$f(x) - f(-x) = ax^r - bx$$

$$f(-x) - f(x) = ax^r + bx$$

$$\Rightarrow f(x) = ax^r + bx$$

$$f(x) = -x^r - \frac{x}{2} \checkmark$$

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$$x = -r \quad f(0) = 1a + 2m \cdot x^r \rightarrow 1 \wedge f(0) = ra + 2m$$

$$x = 0 \quad f(0) = rm - 1 \xrightarrow{x=0} -1 \wedge f(0) = -1a + 2m$$

$$\wedge f(0) = 0$$

$$f(0) = \frac{0}{1} = \frac{ra}{r} \checkmark$$

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$$\text{Sol: } x = -1 \rightarrow f(-1) = \frac{r+1r+r}{-1} \rightarrow f(-1) = -9 \checkmark$$

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استنتاج

$$f(x): ax+b + \frac{a}{x} + b = \frac{ax^2 + bx + a}{x} = \frac{rx^2 - 1rx + r}{x}$$

$$ax+b = rx - 9 \rightarrow f(-1) = -9 \checkmark$$

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