

$$x^3 f(x+1) > 0 \rightarrow f(x+1) = \left(\frac{1}{x}\right)^{x-1} \rightarrow \frac{0}{-} \quad \frac{1}{+} \quad \frac{-}{-}$$

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

$$-x + |2-x| > 0 \rightarrow \begin{cases} -2x+2 > 0 & x < 1 \\ x-1 < 0 & x < 1 \end{cases} \rightarrow x \in (-\infty, 1]$$

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

$$\frac{-x}{-} \quad \frac{1}{+} \quad \frac{2}{-} \quad \frac{3}{+} \rightarrow D_f = (-1, 1] \cup (2, 3)$$

$$\frac{x-1}{f(x)} > 0$$

$$9x^6 - 7x^5 - 5x^4 - 3x^3 + x^2 - x + 1 > 0 \rightarrow (3x^2-1)^2 - (x+2)^2$$

$$(3x^2+x+1)(3x^2-x-3) \rightarrow 3x^2+ax+b = 3x^2-x-3$$

$\Delta < 0$
ریشه ای ندارد.

$$\rightarrow \begin{cases} a = -1 \\ b = -3 \end{cases}$$

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

$$f(x) > f\left(\frac{x}{x}\right) \rightarrow x^3 + x > \left(\frac{x}{x}\right)^3 + \left(\frac{x}{x}\right)$$

$$x^3 + x > \frac{9x^6}{x^3} + \frac{5x^5}{x^3} \rightarrow x^3 + x > \frac{9x^3 + 5x^2}{x^3}$$

$$\frac{x^4 + x^5 - 9x^3 - 5x^2}{x^3} > 0 \rightarrow \frac{(x^2-4)(x^3+4+5x^2) + x^2(x^2-4)}{x^3} =$$

$\Delta < 0$

$$\frac{(x+2)(x-2)(x^3+5x^2+4)}{x^3} > 0$$

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

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

$$\left. \begin{aligned} x^3 + x = 2 &\rightarrow x = 1 \rightarrow f(2) = 1 \\ x^3 + x = 1 &\rightarrow x = 2 \rightarrow f(1) = 2 \end{aligned} \right\} \rightarrow \boxed{f(2) + f(1) = 3}$$

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$$f(x) = (x-2)^3 + 1, \quad g(x) = (x+3)^3 - 1$$

$$\frac{g(\sqrt{2}-2)}{f(\sqrt{2}+2)} = \frac{-1}{1} = \boxed{-1}$$

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$$\left. \begin{aligned} f(x) &= \sqrt{x-5} + 2 \\ g(x) &= |\sqrt{x-5} - 2| \end{aligned} \right\}$$

$$\begin{aligned} f(x) + g(x) &= 2\sqrt{x-5} \quad x > 9 \rightarrow \boxed{\frac{2}{5} = \frac{1}{5}} \quad \text{oo} \\ f(x) + g(x) &= 2 \quad 5 \leq x \leq 9 \rightarrow \boxed{\frac{2}{-5} = -1} \quad \text{X} \end{aligned}$$

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$$f(x) = \frac{x+2}{(x-1)(x-3)} \rightarrow \frac{g(x)}{f(x)} = \left\{ (0, 4), (2, \frac{1}{5}) \right\}$$

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الف) $f(2x) = \left\{ (\frac{1}{2}, 2), (\frac{3}{2}, -1), (2, 2), (-\frac{1}{2}, 4) \right\}$

ب) $f(x^2) = \left\{ (-1, 2), (1, 2), (-\sqrt{3}, -1), (\sqrt{3}, -1), (2, 2), (-2, 2) \right\}$

ج) $\left\{ (-2, 1), (1, 3), (3, 9), (-1, 1) \right\}$

د) $\left\{ (1, -4), (3, -1) \right\}$

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