

$$f(x) = \left(\frac{1}{x}\right)^{x-2} - 1 \quad y = \sqrt{x^3 f(x+1)}$$

$$f(x+1) \rightarrow \frac{1}{x+1}^{(x+1)-2} - 1 = \frac{1}{x+1}^{x-1} - 1 \rightarrow y = \sqrt{x^3 \left(\frac{1}{x+1}\right)^{x-1} - 1}$$

$$\hookrightarrow x^3 \left(\frac{1}{x+1}\right)^{x-1} \geq 0$$

$$\frac{0}{-} \quad \frac{1}{+} \quad \frac{-}{-} \rightarrow D_f = [0, 1] \quad (5)$$

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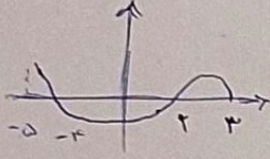
$$f(x) = \sqrt{x + |x+2|}$$

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

$$\begin{cases} -x + x - 2 \geq 0 & -2 \geq 0 \\ -x - x + 2 \geq 0 & -2x \geq -2 \\ & x \leq 1 \end{cases}$$

$$D_f = (-\infty, 1] \quad (5)$$

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$$y = \sqrt{\frac{x-1}{f(x)}} \rightarrow x-1 \geq 0 \quad x \geq 1 \quad [1, +\infty) \quad (1)$$

$$f(x) \mid \begin{array}{c} - \\ + \\ - \\ + \end{array} \begin{array}{c} - \\ + \\ - \\ + \end{array} \begin{array}{c} - \\ + \\ - \\ + \end{array} \rightarrow [-2, 2] \cup [3, +\infty) \quad (2)$$

$$D \cap (2) = [1, 2] \cup [3, +\infty)$$

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$$9x^6 - 4x^4 - 5x - 3 = (3x^3 + ax + b)(3x^3 + cx + d) \rightarrow 9x^6 - 4x^4 - 5x - 3 =$$

$$9x^6 + (3c + 3a)x^4 + (ac + 3d + 3b)x^3 + (ad + bc)x + bd$$

$$\begin{cases} 3c + 3a = 0 & c + a = 0 & c = -a \\ ac + 3d + 3b = -5 \end{cases}$$

$$3x^3 - x - 3 = 3x^3 + ax + b$$

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

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$$f(x) = x^3 + x \quad \sqrt{f(x) - f\left(\frac{x}{x}\right)} \rightarrow \sqrt{x^3 + x - \frac{4x}{x^3} - \frac{x}{x}}$$

$$x(x^3 + 1) - \frac{4x}{x^3} - \frac{x}{x} \geq 0 \quad \frac{-x^4 - 1}{-x^3 + 1} \geq 0$$

$$D_f = [-1, -1] \cup [0, 1] \cup [3, +\infty) \quad (1)$$

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$f(x^3 - x) = 2x^2 - 1$ $\xrightarrow{x=1} f(1) = 2(1) - 1 = 1$ $\xrightarrow{x=2} f(10) = 2(10) - 1 = 19$	$f(1) + f(10) = 1 + 19 = \boxed{20}$	6
$f(x) = x^3 - 4x^2 + 12x = (x-2)^3 + 8$ $g(x) = x^3 + 9x^2 + 20x = (x+3)^3 - 27$ $\frac{g(\sqrt[3]{27}-3)}{f(\sqrt[3]{27}+2)} = \frac{(\sqrt[3]{27}-3+3)^3 - 27}{(\sqrt[3]{27}-2+2)^3 + 8} = \frac{-27}{10} = \boxed{-\frac{27}{10}}$		7
$\sqrt{x+4}\sqrt{x-4} + \sqrt{x-4}\sqrt{x-4}$ $\sqrt{(\sqrt{x-4}+2)^2} = \sqrt{x-4}+2$ $\left. \begin{array}{l} \sqrt{x-4}+2 + \sqrt{x-4}-2 \\ \xrightarrow{x \geq 4} \sqrt{x-4}+2 + \sqrt{x-4}-2 = 2\sqrt{x-4} \checkmark \\ \xrightarrow{x < 4} \sqrt{x-4}+2 - \sqrt{x-4}+2 = 4 \times \end{array} \right\}$ $a+b\sqrt{x+c} = 2\sqrt{x-4} \rightarrow \begin{cases} a+b=2 \\ a+c=x-4 \end{cases} \rightarrow \frac{a+b}{c} = \frac{2}{-4} = \boxed{-\frac{1}{2}}$		8
$f(x) = \frac{x+2}{x^2-4x+3} \rightarrow f(x) = \left[(1, -\frac{1}{3}), (2, \frac{1}{2}), (3, \frac{2}{3}), (0, \frac{2}{3}) \right]$ $\frac{g}{f} = \left[(1, -\frac{1}{3}), (0, 4) \right]$		9
أ) $f(x) = \left[(\frac{1}{4}, 2), (\frac{3}{4}, -1), (2, 2), (-\frac{1}{4}, 4) \right]$ ب) $f(x^2) = \left[(\pm 1, 2), (\pm \sqrt{3}, -1), (\pm 2, 2), (\pm \sqrt{5}, 4) \right]$ ج) $f(g(x)+1) = \left[(-2, 19), (1, 3), (3, 9), (-1, 1) \right]$ د) $\frac{f}{g} = \left[(1, -\frac{1}{3}), (3, -1), (-1, \frac{1}{3}) \right]$		10