

$$1 - 2x = -1 \Rightarrow \boxed{x=1} \Rightarrow f(-1) = 4\sqrt{1} = \boxed{4}$$

$$1 - 2x = 3 \Rightarrow \boxed{x=-1} \Rightarrow f(3) = \sqrt[3]{-1} + 2 = \boxed{1}$$

$$f(3) + f(-1) = 4 + 1 = \boxed{5}$$

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$$x + \sqrt{x} = 6 \Rightarrow \begin{matrix} \sqrt{x}=t \\ t^2 + t - 6 = 0 \Rightarrow (t+3)(t-2) = 0 \end{matrix}$$

$$t = \sqrt{x} \begin{cases} \leftarrow t = -3 \text{ غایب} \\ \leftarrow t = 2 \Rightarrow \sqrt{x} = 2 \Rightarrow \boxed{x=4} \end{cases}$$

$$x^4 + 3x = (4)^4 + 3(4) = 256 + 12 = \boxed{268}$$

(2)

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$$x-1 \leq a, 1-x \leq -a$$

$$f(a) + f(-a) = a^3 + a + (-a)^3 + (-a) = a^3 - a^3 + a - a = \boxed{0}$$

(2)

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$$2(f(1)) - (g(1)) = k \Rightarrow 2(\sqrt{4x-3a} + k - 1) - (\sqrt{b-4x} + 3k)$$

برای اینکه دامنه f و g تداخل داشته باشد مسترک نباشد داریم:

$$4x - 3a \geq 0 \Rightarrow x \geq \frac{3a}{4}, b - 4x \geq 0 \Rightarrow \frac{b}{4} \geq x, D_{f \cap g} = \left[\frac{3a}{4}, \frac{b}{4} \right]$$

$$\left. \begin{aligned} \frac{3a}{4} \geq 1 \rightarrow a \geq \frac{4}{3}, \frac{b}{4} \geq 1 \rightarrow b \geq 4 \\ 2f - g = 2k - 2 - 3k = k \rightarrow k = -1 \end{aligned} \right\} \begin{aligned} 3a - \frac{b}{2} - k = 3\left(\frac{4}{3}\right) - \left(\frac{4}{2}\right) - (-1) \\ \Rightarrow 4 - 2 + 1 = \boxed{3} \end{aligned}$$

(2)

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$$D_g = [-1, +\infty), D_f = (-\infty, m] \Rightarrow D_{f \cap g} = D_g \cap D_f = [-1, m] = [-1, 7]$$

$$\boxed{m=7} \quad (f-g)(3) = 6\sqrt{2} \Rightarrow 2+n-2\sqrt{2} = 6\sqrt{2}$$

$$\boxed{n = 8\sqrt{2} + 2}$$

$$\boxed{m+n = 8\sqrt{2} + 5}$$

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