

$$y = \sqrt{u f(u)} \Rightarrow u f(u) \geq 0$$

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

$$D_f = [-\infty, 0] \cup [2, \infty]$$

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$$y = \sqrt{\frac{-u}{f(u)}} \Rightarrow \frac{-u}{f(u)} \geq 0$$

$$\frac{-3}{-3} + \frac{0}{0} + \frac{2}{2} - \frac{\infty}{\infty}$$

$$f(u) \neq 0 \Rightarrow u \neq 0, 2, -3, 0 \Rightarrow D_f = (-3, 0) \cup (0, 2) \Rightarrow -2, -1, 1$$

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$$f(u) - 2f(2) = u^2 - 3u + 4 \stackrel{f(2)=2}{=} \Rightarrow f(2) - 2f(2) = 4 - 6 + 4 = 2 \Rightarrow -f(2) = 2 \Rightarrow f(2) = -2$$

$$f(-2) \Rightarrow f(-2) + 4 = 4 + 4 + 4 = 12 \Rightarrow f(-2) = 10$$

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$$f(f(\infty)) + f(f(1)) = 7 + 2 = 9 \checkmark$$

$$\left. \begin{array}{l} \downarrow \\ f(\infty) = \infty - \sqrt{9} = 2 \\ \downarrow \\ f(f(\infty)) = f(2) = 4 + 3 = 7 \end{array} \right\} \Rightarrow f(1) = 2 + 3 = 5 \Rightarrow f(f(1)) = f(5) = 2$$

$$f(\infty) = \infty - \sqrt{9} = 2$$

$$f(f(\infty)) = f(2) = 4 + 3 = 7$$

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$$f(u-1) - f(u) = 4u + 2 \quad f(u) = au^2 - bu + 2$$

$$au^2 - 2au + a - bu + b + 2 - au^2 + bu - 2 = 4u + 2 \Rightarrow -2a + a + b = 4u + 2$$

$$\Rightarrow -2a = 4 \Rightarrow a = -2$$

$$a + b = 2 \Rightarrow -2 + b = 2 \Rightarrow b = 4 \Rightarrow a - b = -6$$

✓ (۲)

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$$f(\sqrt{x} - 2) = \frac{x - 4\sqrt{x} + 4 + 4\sqrt{x} - 8 + 4}{x - 4\sqrt{x} + 4 + 4\sqrt{x} - 8 + 4} = \frac{-4}{4} = -1 \quad \checkmark$$

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$$f\left(u - \frac{1}{u}\right) = \frac{u^4 + 1}{u^4} \Rightarrow f\left(u - \frac{1}{u}\right) = u^4 + \frac{1}{u^4} = u^4 + \frac{1}{u^4} - 2 + 2 = \left(u - \frac{1}{u}\right)^4 + 2$$

$$\Rightarrow f(u) = u^4 + 2 \Rightarrow f(-3) = 9 + 2 = 11 \quad \checkmark$$

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$$f(u) = \{(2, 0), (1, -4), (0, 2), (3, 1)\} \quad g(u) = \sqrt{9 - u^4}$$

$$\text{الف) } \frac{f}{g} = \left\{ \left(0, \frac{2}{3}\right), \left(1, -\frac{4}{3}\right), \left(2, 0\right), \left(3, \frac{1}{3}\right) \right\} = \left\{ \left(0, \frac{2}{3}\right), \left(1, -\frac{4}{3}\right), \left(2, 0\right), \left(3, \frac{1}{3}\right) \right\}$$

$$\text{ب) } \frac{g}{f} = \left\{ \left(0, \frac{3}{2}\right), \left(1, -\frac{3}{4}\right), \left(2, 0\right), \left(3, 3\right) \right\}$$

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$$f(u) = \{(-5, 2), (1, -2), (2, 1), (3, 4)\}$$

$$\text{الف) } 2f(u) = \{(-5, 4), (1, -4), (2, 2), (3, 8)\}$$

$$\text{ب) } f(u) + 1 = \{(-5, 3), (1, -1), (2, 2), (3, 5)\}$$

$$\text{ج) } 2f^2(u) + 1 = \{(-5, 13), (1, 13), (2, 4), (3, 29)\}$$

$$\text{د) } f(2u) = \left\{ \left(-\frac{5}{2}, 2\right), \left(\frac{1}{2}, -2\right), (1, 1), \left(\frac{3}{2}, 4\right) \right\}$$

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$$f(u) = \{(2, 3), (3, 2), (1, 4), (3, 1), (5, 2)\} \quad g(u) = \{(1, 0), (2, 1), (-1, 5), (-2, -3), (3, -1)\}$$

$$\text{الف) } f - g = \{(1, 4), (2, 2), (3, 2)\}$$

$$\text{ب) } \frac{2f}{g} = \{(2, 6), (3, -2)\}$$

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