

$$y = \sqrt{x f(x)} \Rightarrow x f(x) \geq 0 \Rightarrow \begin{cases} \text{if } x > 0 \Rightarrow f(x) \geq 0 \Rightarrow D_f = [0, \infty) \\ \text{if } x < 0 \Rightarrow f(x) \leq 0 \Rightarrow D_f = (-\infty, 0] \end{cases}$$

$$\Rightarrow D_f = [-\infty, 0] \cup [0, \infty)$$

$$y = \sqrt{\frac{-x}{f(x)}} \Rightarrow \frac{-x}{f(x)} \geq 0, f(x) \neq 0$$

$$\Rightarrow \left\{ \begin{array}{l} \text{if } x \leq 0 \Rightarrow f(x) > 0 \Rightarrow D_f = (-\infty, 0) \\ \text{if } x > 0 \Rightarrow f(x) < 0 \Rightarrow D_f = (0, \infty) \end{array} \right\} \Rightarrow D_f = (-\infty, 0) \cup (0, \infty)$$

اعداد صحیح = $\{-2, -1, 1\} = 3$

$$f(x) - 2f(2) = x^2 - 4x + 4 \text{ و } f(-2) = ?$$

$$x=2 \Rightarrow f(2) - 2f(2) = 4 - 4 + 4 \Rightarrow -f(2) = 2 \Rightarrow f(2) = -2$$

$$x=-2 \Rightarrow f(-2) + 4 = 4 + 4 + 4 = 12 \Rightarrow \underline{f(-2) = 10}$$

$$f(f(5)) + f(f(1)) = ?$$

$$x=1 \Rightarrow f(1) = 5, \quad x=5 \Rightarrow f(5) = 5 - \sqrt{9} = 2$$

$$x=2 \Rightarrow f(2) = 7 \Rightarrow \boxed{f(2) + f(5) = 7 + 2 = 9}$$

$$f(x-1) - f(x) = 4x + 2$$

$$\Rightarrow a(x-1)^2 + b(x-1) + c - (ax^2 + bx + c) = 4x + 2$$

$$\Rightarrow a - 2ax - b = 4x + 2 \Rightarrow 4 = -2a \Rightarrow a = -2$$

$$\text{و } a - b = 2 \Rightarrow -2 - b = 2 \Rightarrow b = -4 \Rightarrow \boxed{-2 - 4 = -6}$$

$$\frac{2f(x) + f(-1)}{f'(x)} = ? \Rightarrow f(x) = 9 - 9 + 1 = 1, f(-1) = 1 + 1 + 1 = 3$$

$$, f(x) = 9 - 9 + 1 = -1$$

$$\Rightarrow \frac{2(1) + 3}{(-1)^2} = \frac{5}{1} = \boxed{5}$$

$$\frac{3f(x) - 2f(-x)}{f(x)} = ? \Rightarrow f(x) = 1^4 + 1 = 2, f(-x) = (-x)^4 = x^4$$

$$, f(x) = 9 + 1 = 10$$

$$\Rightarrow \frac{3(10) - 2(x^4)}{10} = \frac{30 - 2x^4}{10} = \boxed{\frac{3 - x^4}{5}}$$

$$\frac{f(f(x)) - f(f(x))}{f(1) - x} = \frac{f(1) - f(x)}{f(1) - x} = \frac{4 - 4}{4 - 2} = \boxed{0}$$

$$f(f(\sqrt{x-1})) = ? \Rightarrow f(\sqrt{x-1}) = \frac{x + 1 - \sqrt{x-1} + \sqrt{x-1} - 1 + 9}{x + 1 - \sqrt{x-1} + \sqrt{x-1} - 1 + 9} = \frac{1}{1} = 1$$

$$\Rightarrow f(x) = \frac{x + 1 + 9}{x + 1 + 9} = \boxed{\frac{11}{20}}$$

$$(f(\sqrt{x}))^x - f(x) = ? \Rightarrow f(\sqrt{x}) = x + \frac{1}{x}$$

$$\Rightarrow \left(x + \frac{1}{x}\right)^x - f(x) \Rightarrow x^x + \frac{1}{x^x} + x - \left(x^x + \frac{1}{x^x}\right) = \boxed{x}$$