

$$y = \sqrt{x f(x)} \implies x f(x) \geq 0 \quad D_f = [-5, 0] \cup [2, 5]$$

باید هر دو منفی یا هم علامت باشند

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$$y = \sqrt{\frac{-x}{f(x)}} \implies \frac{-x}{f(x)} \geq 0, f(x) \neq 0 \rightarrow x \neq -3, 0, 2, 5$$

$\frac{-x}{f(x)}$ و $\frac{f(x)}{x}$ باید قیافه علامت باشند.

$$D_f = (-3, 0) \cup (0, 2) \implies \text{اعداد صحیح: } -2, -1, 1 \Rightarrow \boxed{\text{۳ عدد صحیح}}$$

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$$f(x) - 2f(2) = x^2 - 3x + 4 \xrightarrow{x=2} f(2) - 2f(2) = \cancel{4}^4 - 3(\cancel{2})^2 + 4$$

$$-f(2) = 2 \rightarrow f(2) = -2$$

$$f(-2) - 2(-2) = \cancel{(-2)^2}^4 - 3(\cancel{-2})^2 + 4 \rightarrow \boxed{f(-2) = 10}$$

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$$f(5) = 5 - \sqrt{5+4} = 2 \quad f(1) = 2(1) + 3 = 5$$

$$f(2) + f(5) = \underbrace{(2(2) + 3)}_7 + \underbrace{(5 - \sqrt{5+4})}_2 = \boxed{9}$$

۲ ✓

$$f(x-1) - f(x) = (a(x-1)^2 - b(x-1) + 2) - (ax^2 - bx + 2)$$

$$f(x-1) - f(x) = ax^2 - 2ax + a - \cancel{bx} + b + 2 - \cancel{ax^2} + \cancel{bx} - 2 = -2ax + a + b$$

$$\begin{cases} f(x-1) - f(x) = 4x + 2 \\ -2ax + a + b = 4x + 2 \end{cases}$$

$$\begin{aligned} -2ax + a + b &= 4x + 2 \rightarrow -2a = 4 \rightarrow a = -2 \\ a + b &= 2 \rightarrow -2 + b = 2 \rightarrow b = 4 \end{aligned}$$

$$a - b = -2 - 4 = \boxed{-6} \quad ۲ \checkmark$$

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$$\frac{r f(r) + f(-1)}{f'(r)} = \frac{r(9-9+1) + (1+r+1)}{(r-9+1)^r} = \frac{r}{1} = \boxed{r}$$

(r) ✓

6

$$\frac{r f(r) - r f(-r)}{f'(r)} = \frac{r(r(r)+1) - r(-r)^r}{r(r)+1} = \frac{r9-1}{r} = \boxed{\frac{r1}{r}}$$

(r) ✓

7

$$\frac{f(f(r)) - f(f(r))}{f(1)-r} = \frac{f(1) - f(r)}{9-r} = \frac{9-9}{r} = \boxed{0}$$

(r) ✓

8

$$f(x) = \frac{x^r + rx + 9}{x^r + rx + 2} = \frac{x^r + rx + r + 2}{x^r + rx + r + 1} = \frac{(x+r)^r + 2}{(x+r)^r + 1}$$

$$f(\sqrt{r}-r) = \frac{(\sqrt{r}-r+r)^r + 2}{(\sqrt{r}-r+r)^r + 1} = \frac{r+2}{r+1} = \frac{1}{r} = r$$

$$f(f(\sqrt{r}-r)) = f(r) = \frac{(r+r)^r + 2}{(r+r)^r + 1} = \boxed{\frac{r1}{1r}}$$

(r) ✓

9

$$f(\sqrt{x}) = (\sqrt{x})^r + \frac{1}{(\sqrt{x})^r} = x + \frac{1}{x}$$

$$(f(\sqrt{x}))^r - f(x) = (x^r + r + \frac{1}{x^r}) - (x^r + \frac{1}{x^r}) = \cancel{x^r} + r + \cancel{\frac{1}{x^r}} - \cancel{x^r} - \cancel{\frac{1}{x^r}} = \boxed{r}$$

(r) ✓

10