

$$y = \sqrt{x f(x)} \rightarrow \sqrt{x f(x)} \geq 0 \rightarrow \begin{array}{c} -5 \quad 0 \quad 2 \quad 5 \\ -\phi + \phi - \phi + \phi - \\ 0 \quad 2,5 \quad -5 \end{array} \rightarrow D_f = [-5, 0] \cup [2, 5]$$

$$y = \sqrt{\frac{-x}{f(x)}} = \frac{-x}{f(x)} \geq 0 \rightarrow \begin{array}{c} -3 \quad 0 \quad 2 \quad 5 \\ +\phi - \phi + \phi - \phi + \\ 2,5 \quad 1 \quad -3 \end{array} \rightarrow D_f = [0, 2] \cup (5, +\infty) \cup (-\infty, -3)$$

$$I \quad f(x) - 2f(2) = x^2 - 3x + 2$$

$$IV \quad f(-2) - 2f(-2) = (-2)^2 - 3(-2) + 2 \Rightarrow f(-2) = 10$$

$$II \quad f(-2) - 2f(1) = (-2)^2 - 3(-2) + 2 \Rightarrow f(-2) = 10$$

$$III \quad f(2) - 2f(2) = 2^2 - 3(2) + 2 \Rightarrow f(2) = -2$$

$$f(x) = \begin{cases} x - \sqrt{x+2} & x > 3 \\ 2x + 3 & x \leq 3 \end{cases} \quad f(f(5)) + f(f(1))$$

$$I \quad f(5) = f(5 - \sqrt{5+2}) = f(2) \rightarrow f(2) = 2 + 3 = 5$$

$$II \quad f(f(1)) = f(2 + 3) = f(5) = 5 - \sqrt{5+2} = 2 \Rightarrow 5 + 2 = 7$$

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

$$f(x-1) - f(x) = ax^2 + a - 2ax - b(x-1) + 2 - (ax^2 - bx + 2) = 4x + 7$$

$$\rightarrow a - 2ax + b = 4x + 7$$

$$\rightarrow -2ax = 4x \Rightarrow a = -2$$

$$-2x + b = 7 \Rightarrow b = 7 + 2x$$

$$\rightarrow a - b = -2 - 7 = -9$$

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

$$\frac{f(4) + f(-1)}{f'(1)}$$

$$I \quad f(4) = 9 - 9 + 1 = 1 \Rightarrow f(4) = 1$$

$$II \quad f(-1) = (-1)^2 - 4(-1) + 1 = 6 \Rightarrow f(-1) = 6$$

$$III \quad f(1) = 1 - 4 + 1 = -2 \Rightarrow f(1) = -2$$

$$IV \quad \frac{1 + 6}{-2} = -\frac{7}{2}$$

$$f(x) = \begin{cases} 3x+1 & x \geq 1 \\ x^2 & x < 1 \end{cases}$$

$$\frac{3f(1) - 2f(-1)}{f(1)}$$

$$I = f(1) = 3 \times 1 + 1 = 4 \Rightarrow 3f(1) = 12$$

$$II = f(-1) = (-1)^2 = 1 \Rightarrow 2f(-1) = 2$$

$$III = f(1) = 3 \times 1 + 1 = 4$$

$$IV = \frac{12 - 2}{4} = \frac{10}{4} = \frac{5}{2}$$

$$f = \{(1, 4), (3, 1), (1, 1), (1, 4)\}$$

$$\frac{f(f(1)) - f(f(3))}{f(1) - 2} = \boxed{?}$$

$$I \quad \frac{f(1) - f(3)}{1 - 3} = 0$$

$$II \Rightarrow \frac{f(f(1)) - f(f(3))}{f(1) - 2} = 0$$

$$f(f(\sqrt{3} - 1))$$

$$I \quad f(\sqrt{3} - 1) = (\sqrt{3} - 1)^2 + 1(\sqrt{3} - 1) + 9$$

$$= (3 - 2\sqrt{3} + 1) + \sqrt{3} - 1 + 9$$

$$= 3 - 2\sqrt{3} + 1 + \sqrt{3} - 1 + 9$$

$$= 12 - \sqrt{3}$$

$$f(x) = x^2 + 8x + 9$$

$$\frac{x^2 + 8x + 9}{x^2 + 8x + 0}$$

$$II \quad f(1) = 1^2 + 8 \times 1 + 9 = 18$$

$$f(1) = 1^2 + 8 \times 1 + 9 = 18$$

$$(f(\sqrt{x}))^2 - f(x)$$

$$f(\sqrt{x}) = (\sqrt{x})^2 + \frac{1}{(\sqrt{x})^2} + \frac{1}{\sqrt{x}} + \frac{1}{x} \Rightarrow (x + \frac{1}{x})^2 + \frac{1}{x} + \frac{1}{x^2}$$

$$x^2 + \frac{1}{x^2} + 2 + \frac{1}{x} - x^2 - \frac{1}{x^2} = 2$$