

$$x f(x) \gg 0$$

$$\begin{array}{ccccccc} -\infty & 0 & 2 & \infty \\ - & + & - & + & - \end{array}$$

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

$$\frac{-x}{f(x)} \gg 0$$

$$\begin{array}{ccccccc} -3 & 0 & 2 & \infty \\ - & + & - & + \end{array}$$

$$\rightarrow D_f = (-3, 0) \cup (0, 2) \cup (\infty, +\infty)$$

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

$$x=-2 \rightarrow f(-2) - 2f(-2) = 4 + 4 + 4 \rightarrow f(-2) = 10 \checkmark$$

$$f(5) = 5 - \sqrt{9} = 5 - 3 = 2 \quad \text{ضابطه اول}$$

$$f(f(5)) = f(2) = 4 + 3 = 7 \quad \text{ضابطه دوم}$$

$$7 + 2 = 9$$

$$f(1) = 2 + 3 = 5 \quad \text{ضابطه اول}$$

$$f(f(1)) = f(5) = 2$$

$$x \rightarrow x-1 \quad x^2 + 1 - 2x$$

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

$$f(x-1) - f(x) = 4x + 2 \rightarrow ax^2 - (2a+b)x + a+b+2 - ax^2 + bx - 2 = 4x + 2 \rightarrow a-b = -3 \quad \text{و} \quad -a-b = -1$$

$$\rightarrow -2a - b + b = 4 \rightarrow -2a = 4 \rightarrow a = -2, \quad a+b+2-2=2 \rightarrow a+b=2 \rightarrow b=4 \quad \text{و} \quad a+b+2=2 \rightarrow b=4$$

$$f(3) = 9 - 9 + 1 = 1$$

$$f(-1) = 1 + 3 + 1 = 5$$

$$f(2) = 4 - 9 + 1 = -4$$

$$\rightarrow \frac{2f(2) + f(-1)}{f(2)} = \frac{2 + 5}{-4} = -\frac{7}{4}$$

$$f(4) = 16 + 1 = 17 \rightarrow \text{ضابطه اول}$$

$$f(-2) = 4 \rightarrow \text{ضابطه دوم}$$

$$f(3) = 9 + 1 = 10 \rightarrow \text{ضابطه اول}$$

$$\rightarrow \frac{3f(3) - 2f(-2)}{f(3)} = \frac{30 - 8}{10} = \frac{22}{10} = \frac{11}{5} \checkmark$$

$$\frac{f(f(4)) - f(f(3))}{f(1) - 2} = \frac{4 - 9}{4 - 2} = -\frac{5}{2}$$

$$f(x) = \frac{x^r + rx + 9 - \omega + \omega}{x^r + rx + \omega - 1 + 1} = \frac{(x+r)^r + \omega}{(x+r)^r + 1} \longrightarrow f(\sqrt{x}-r) = \frac{(\sqrt{x}-r+r)^r + \omega}{(\sqrt{x}-r+r)^r + 1} = \frac{r+\omega}{r+1} = \frac{1}{r} = k$$

$$f(r) = \frac{r^r + \omega}{r^r + 1} = \frac{r!}{r!} \checkmark$$

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

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