

$$f(x) > 0$$

$$x = -\infty$$

$$x = 2$$

$$x = \infty$$

$$-\infty \quad 0 \quad 2 \quad \infty$$

$$- \quad + \quad - \quad + \quad - \quad \leftarrow$$

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

✓

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

$$\frac{x}{f(x)} \leq 0$$

$$Df = (-\infty, 0) \cup (0, 2)$$

$$-2, -1 \rightarrow$$

$$f(x) \neq 0$$

$$f(x) < 0, x > 0$$

$$f(x) > 0, x < 0$$

$$-2 \quad -1 \quad 0 \quad 2 \quad \infty$$

$$+ \quad + \quad - \quad - \quad + \quad +$$

$$f(2) - 2f(2) = 4 - 4 + 8$$

$$f(-2) - 2f(2) = (-2)^2 - 4 \cdot 2 - 4 + 8 = f(-2) + 4 = 12$$

$$-f(2) = 2$$

$$f(2) = -2$$

$$f(-2) = +6$$

✓

$$f(2) = 2 - \sqrt{2} = 2 - 1 = 1$$

$$f(1) = 2 \cdot 1 + 3 = 5$$

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

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

$$f(2) = 1 + 2 = 3$$

$$3 + 2 = 5$$

✓

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

$$ax^2 - 2ax + a - bx + b + 2$$

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

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

$$a + b = 4$$

$$-2a + b = 2$$

$$b = a$$

$$a + b = -2 - 2 = -4$$

$$-2a = 4 \quad a = -2$$

✓

$$f(w) \rightarrow 9 - 9 + 1 = 1$$

$$f(-1) \rightarrow 1 + w + 1 = w$$

$$\frac{4 \times 1 + w}{1} = \boxed{V}$$

$$f(v) = 8 - w \times v + 1 = -1$$

$$f^v(v) = -1^v = 1$$

(P) ✓

$$f(f) \rightarrow f, v \quad f(e) = w \times e + 1 = 1w$$

$$f(-v) \rightarrow f(v) = (-v)^v = 8$$

$$\frac{w \times 1w - v \times 8}{v} = \frac{49 - 8}{v} = \boxed{\frac{41}{v}}$$

$$f(v) = f(v) = w \times v + 1 = v$$

(P) ✓

$$\frac{f(f(f)) - f(f(v))}{f(1) - v} \rightarrow \frac{4 \frac{f(1) - f(v)}{f}}{f} = \frac{0}{f} = 0$$

(P) ✓

$$x = \sqrt{w} - v \rightarrow x^v + e x \rightarrow (\sqrt{w} - v)^v + e(\sqrt{w} - v) = v - \sqrt{w} + e\sqrt{w} - 1 = -1$$

$$\frac{x^v + e x + 9}{x^v + e x + w} = \frac{-1 + 9}{-1 + w} = \frac{8}{e} = \boxed{v} \quad f(v) \rightarrow \frac{v^v + 1 + 9}{e + 1 + w} =$$

(P) ✓

$$\boxed{\frac{41}{14}}$$

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

$$x^v + v + \frac{1}{x^v}$$

$$(x^v + v + \frac{1}{x^v}) - (x^v + \frac{1}{x^v}) = \boxed{v}$$

(P) ✓