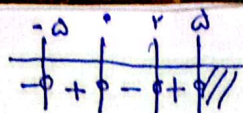


$x f(x) \geq 0 \Rightarrow \begin{cases} x=0 \\ f(x) = -2, 2 \end{cases}$

$D_f = [-2, 0] \cup [2, 2]$



①

مؤلف: محمد عبد الله بن محمد

$\{1, 2, 3\} \leftarrow$

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$\frac{-x}{f(x)} \geq 0 \Rightarrow \frac{x}{f(x)} \leq 0 \Rightarrow \begin{cases} x=0 \\ f(x) = 2, 2, 0, -2 \end{cases}$

②

$D_f = (-2, 2) - \{0\} \rightarrow$

$f(2) = f(2) - 2f(2) = 2 - 4 + 2 = 0 \Rightarrow -f(2) = 2 \Rightarrow f(2) = -2$

$f(-2) = f(-2) - 2f(-2) = 2 + 4 + 2 = 8 \Rightarrow f(-2) = 1$

③

$f \circ g \rightarrow \{(1, 2), (2, 2), (3, 2)\}$

$\frac{f}{g} \rightarrow \{(1, \frac{2}{2}), (2, \frac{2}{2}), (3, \frac{2}{2})\}$

$= \{(2, 2), (3, 2)\}$

$f(2) = 2 - \sqrt{2+2} = 2 - \sqrt{4} = 0$

$f(2) = 2 + 3 = 5$

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

$f(f(2)) + f(f(1)) = 5 + 5 = 10$

④

$f(x-1) - f(x) = 4x + 2 \quad f(x) = ax^2 + bx + c$

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

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

$\Rightarrow -2ax + a + b - bx + b - 4x - 2 = 0$

$\Rightarrow (-2a - b - 4)x + a + b - 2 = 0$

⑤

$\Rightarrow (2a + b + 4)x = a + b - 2 \Rightarrow x = \frac{a + b - 2}{2a + b + 4}$

$\frac{x=0}{x=1} \begin{cases} a + b = 2 \\ a - b = -1 \end{cases}$

$2a = -1 \Rightarrow a = -\frac{1}{2} \Rightarrow b = \frac{5}{2} \Rightarrow a - b = -\frac{5}{2} - \frac{1}{2} = -3$

-3

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

⑥

$\Rightarrow f(\sqrt{3} - 2) = \frac{(\sqrt{3} - 2 + 1)^2 + 1}{(\sqrt{3} - 2 + 1)^2 + 1} = \frac{2 + 1}{2 + 1} = \frac{3}{3} = 1$

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

⑦

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

$\rightarrow f(-3) = (-3)^2 + 2 = 11$

$D_f = \{1, 2, 0, 2\}, D_g \rightarrow 2 - x^2 \geq 0 \Rightarrow |x| \leq 2 \Rightarrow [-2, 2]$

⑧

$D_f = \{0, 2, 2\}$

$\frac{f}{g} = \{(0, \frac{2}{2}), (1, \frac{2}{\sqrt{2}}), (2, \frac{2}{\sqrt{2}})\} = \{(0, 1), (1, \frac{2}{\sqrt{2}}), (2, \frac{2}{\sqrt{2}})\}$

$\frac{g}{f} = \{(0, \frac{2}{2}), (1, \frac{2\sqrt{2}}{2}), (2, \frac{2\sqrt{2}}{2})\} = \{(0, 1), (1, \sqrt{2}), (2, \sqrt{2})\}$

$\{ (2, 2), (3, 1), (-2, 4), (1, -2) \}$

$\{ (2, 2), (3, 2), (-2, 3), (1, -1) \}$

$\{ (2, 4), (3, 4), (-2, 3), (1, 3) \}$

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