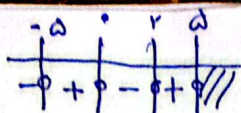


$x f(x) \geq 0 \Rightarrow x = 0$
 $f(x) = -a, 2, a$
 $D_f = [-a, 0] \cup [2, a]$



①

کتابخانه عمومی

$\{1, 2, 3\} \leftarrow$ 19

الف) $f \circ g \rightarrow \{(1, 4), (2, 2), (3, 2)\}$

ب) $\frac{f}{g} \rightarrow \{(1, \frac{4}{2}), (2, \frac{2}{2}), (3, \frac{2}{2})\}$
 $= \{(2, 4), (3, 2)\}$

$\frac{-x}{f(x)} \geq 0 \Rightarrow \frac{x}{f(x)} \leq 0 \Rightarrow x = 0$
 $f(x) = a, 2, -3$

$D_f = (-3, 2) - \{0\} \rightarrow$ صحيح

②

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

$\frac{f(-x)}{f(x)} \Rightarrow f(-x) - 2f(x) = x + 4 + 2 \Rightarrow f(-x) = 1$

③

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

$f(f(a)) + f(f(1)) =$
 $\Rightarrow 5 + 2 = 7$

④

لا

$f(x-1) - f(x) = 4x + 2$
 $\Rightarrow a(x-1)^2 - b(x-1) - a x^2 + b x - 4x - 2 = 0$
 $\Rightarrow a x^2 - 2a x + a - b x + b - a x^2 + b x - 4x - 2 = 0$
 $\Rightarrow -2a x + a + b - 4x - 2 = 0 \Rightarrow x(-2a - 4) + a + b - 2 = 0$

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

$\frac{x=0}{x=1} \Rightarrow \begin{cases} a + b = 2 \\ a - b = -1 \end{cases}$
 $2a = -1 \Rightarrow a = -\frac{1}{2} \Rightarrow b = \frac{5}{2} \Rightarrow a - b = -\frac{5}{2} = -2.5$

⑤

$f(x) = \frac{x^2 + 2x + 1}{x^2 + 2x + 3} = \frac{(x+1)^2 + 1}{(x+1)^2 + 3}$

⑥

$\Rightarrow f(\sqrt{3} - 2) = \frac{(\sqrt{3} - 2 + 1)^2 + 1}{(\sqrt{3} - 2 + 1)^2 + 3} = \frac{3 + 1}{3 + 3} = \frac{4}{6} = \frac{2}{3}$

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

⑦

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

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

$D_f = \{1, 2, \dots, 10\}$, $D_g \rightarrow 9 - x^2 \geq 0 \Rightarrow |x| \leq 3 \Rightarrow [-3, 3]$

⑧

$\frac{f}{g} = \{(0, \frac{3}{4}), (1, \frac{2}{\sqrt{2}}), (2, \frac{1}{\sqrt{2}})\} = \{(0, \frac{3}{4}), (1, \frac{\sqrt{2}}{2}), (2, \frac{1}{\sqrt{2}})\}$

$\frac{g}{f} = \{(0, \frac{4}{3}), (1, \frac{2\sqrt{2}}{2}), (2, \frac{\sqrt{2}}{1})\} = \{(0, \frac{4}{3}), (1, \sqrt{2}), (2, \sqrt{2})\}$

الف) $\{(2, 2), (3, 1), (-5, 4), (1, -1)\}$ ب) $\{(2, 2), (3, 4), (-5, 3), (1, -1)\}$

ج) $\{(2, 4), (3, 4), (-5, 13), (1, 13)\}$ د) $\{(1, 1), (\frac{3}{4}, 4), (-\frac{5}{4}, 2), (\frac{1}{4}, -2)\}$

⑨