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مینا رضایی

۱) $D_{gof(x)} = \{x \in D_f \ , \ f(x) \in D_g\}$ ① ② $\quad D_g \Rightarrow -x^2+4x-4 \geq 0 \to$ (۲ ، $-\ 0\ -$) $\Rightarrow$ ج $= \{2\}$

① $x-1>0 \to x>1 \ , \ \log_2^{x-1} \geq 0 \to x-1 \geq 1 \to x \geq 2$

② $\sqrt{\log_2^{x-1}} = 2 \to \log_2^{x-1} = 4 \to x-1 = 16 \to x = 17$

$① \cap ② \to D_{fog} = \{17\}$

۲) $fog(x) = gof(x) \to 2x^2-6x+16-5 = 4x^2-20x+25-6x+15+8$

$\to 2x^2-20x+37=0 \to x = \frac{-b\pm\sqrt{\Delta}}{2a} = \frac{20\pm\sqrt{104}}{4}$ مجموع مربعات ریشه‌ها

$\frac{(10+\sqrt{24})^2}{4} + \frac{(10-\sqrt{24})^2}{4} = \frac{100+24+20\sqrt{24}+100+24-20\sqrt{24}}{4} = \frac{252}{4} = 63$

۳) g(x) را پیدا می‌کنیم $\to g(2x) = 5x^2+11 \quad \xrightarrow{2x=t \to x=\frac{t}{2}} 5\times\frac{t^2}{4}+11 \to g(x) = \frac{5t^2}{4}+11$

$g(x-7) = \frac{5\times(x-7)^2}{4}+11 = \frac{5x^2-70x+245}{4}+11 = \frac{5x^2-70x+289}{4}$

$Min = \frac{-b}{2a} = \frac{70}{10} = 7 \xrightarrow{\text{جایگذاری}} \frac{0}{4}+11 = 11$

۴) $3g-4 = 3x^2-6x-1 \to 3g = 3x^2-6x+3 \to g = x^2-2x+1 = (x-1)^2$

$gof(x) = (3x-4-1)^2 = (3x-5)^2 = 9x^2-30x+25$

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$f(x) - g(x) = -x + 5 \xrightarrow{x-2} \begin{cases} -2f(x) + 2g(x) = 2x - 10 \\ 3f(x) - 2g(x) = 14 \end{cases} \Rightarrow \begin{cases} f(x) = 2x + 4 \\ g(x) = 3x - 1 \end{cases}$

$3f(x) - 2g(x) = 14$

$fog(x) = 6x - 2 + 4 = 6x + 2 \xrightarrow{(a,0)} 6a + 2 = 0 \rightarrow 6a = -2 \rightarrow a = -\frac{1}{3}$

۶—

$fog(x) \leq gof(x) \longrightarrow 9^{\log_3 x} \leq \log_3 9^x \longrightarrow x^{\log_3 9} \leq x \log_3 9$

$x^2 \leq 2x \longrightarrow x^2 - 2x \leq 0 \longrightarrow \underset{+\ \ -\ \ +}{0 \quad 2} \longrightarrow 0, 1, 2 \rightarrow \{0, 1, 2\}$ → ۳ عدد

غ ق ق

۷—

$f\left(x - \frac{2}{x}\right) = \underbrace{x^2 + \frac{4}{x^2}}_{x^2 + \frac{4}{x^2} - 4 + 4} + \underbrace{x - \frac{2}{x}}_{t} - 4 \xrightarrow{x - \frac{2}{x} = t} f(t) = t^2 + t$

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

۸—

$D_{fog} = \{x \in D_g \ ,\ g(x) \in D_f\}$

$x \in R \qquad 8x - x^2 > 0 \longrightarrow \underset{-\ \ +\ \ -}{0 \quad 8} \longrightarrow D_{fog} = (0, 8)$

$R_g \longrightarrow x_s = \frac{-b}{2a} = \frac{-8}{-2} = 4 \longrightarrow y_s = 16 \longrightarrow R_g = (-\infty, 16] \rightarrow R_g = D_f$

$D_f = (0, 16] \longrightarrow R_{fog} = (-\infty, 4] \qquad (0, 8) \cap (-\infty, 4] \longrightarrow (0, 4]$

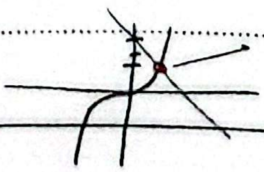
۹—

$f(\underbrace{f(x)}_{t}) = 1 - 3f(x)^2 \longrightarrow f(t) = 1 - 3t^2 \rightarrow f(x) = -3x^2 + 1$

$h(g(x)) = f(x) \rightarrow (x-1)^3 + 2(x-1) + 1 = -3x^2 + 1$

$x^3 - 3x^2 + 5x - 3 = -3x^2 \longrightarrow x^3 + 5x - 3 = 0 \rightarrow x^3 = -5x + 3$

ا ریشه دارد



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$f(x) = x - \frac{4}{x}$ ، $g \circ f(x) = ax^2 + 2x$ ، $g(2) = 8$ ـ 10

$g(2) = 8 \rightarrow f(x) = 2 \rightarrow x - \frac{4}{x} = 2 \rightarrow \frac{x^2 - 4}{x} = 2 \rightarrow x^2 - 2x - 4 = 0$

$(x+1)(x-4) = 0 \rightarrow x = -1, 4$

5

$g(f(-1)) = g(2) \rightarrow a(-1)^2 + 2(-1) = 8 \rightarrow a - 2 = 8 \rightarrow a = 10$

$g(f(4)) = g(2) \rightarrow 4a + 8 = 8 \rightarrow a = 0$ X ← (چون تابع f تابع خطی نیست)

← gof هم خطی نیست if $a \neq 0$ ← gof خطی نیست

10 $x = -1$ قابل قبول $\rightarrow x = 4$ ✓ $\rightarrow a = 10$