

73. $f(x) = \begin{cases} x^2 - 3x, & x \leq 0 \\ \sqrt{x+1}, & x > 0 \end{cases} \quad g(x) = \frac{x+3}{x+2}.$

$f \circ g.$

$$(: (f \circ g)(x) = \begin{cases} \frac{(x+3)(-2x-3)}{(x+2)^2}, & x \in [-3, -2) \\ \sqrt{\frac{2x+5}{x+2}}, & x \in (-\infty, -3) \cup (-2, +\infty) \end{cases})$$

74. $f(x) = \begin{cases} 2x-1, & x < 1 \\ \frac{x}{x+3}, & x \geq 1 \end{cases} \quad g(x) = \begin{cases} \frac{1}{x}, & -5 \leq x \leq -1 \\ x-2, & -1 < x \leq 9 \end{cases}.$

$f \circ g.$

$$(: (f \circ g)(x) = \begin{cases} \frac{2}{x} - 1, & x \in [-5, -1] \\ 2x-5, & x \in (-1, 3) \\ \frac{x-2}{x+1}, & x \in [3, 9] \end{cases})$$

75. $f: [1, 10] \rightarrow \mathbb{R}.$

μ

$f(3|x|-5).$

$(: D_{f \circ g} = [-5, -2] \cup [2, 5])$

76. $f: [-2, 2] \rightarrow \mathbb{R}.$

μ

$f(2x-2).$

$(: D_{f \circ g} = [0, 2])$

77. $f \mu \quad \mu \quad \mu [0, 1].$

μ
 $) f(x^2) \quad) f(x-4) \quad (:) D_{f \circ g} = [-1, 1], \beta) D_{f \circ g} = [4, 5]$

78. $f \quad \mu \quad \mu \quad \mu [5, 8].$

μ
 $g(x) = f(x+8) - f(9-x^2)$

$(: D_{f \circ g} = [-2, -1])$

79. $f(x) = \frac{3x-2}{x-3}, g(x) = \frac{1}{1-x}$ και $h(x) = \frac{1}{x}.$:

$) (h \circ g \circ h \circ g)(x) = x,$ $x \neq 0$ και $x \neq 1.$

$) (f \circ f)(x) = x$ $x \neq 3.$

80. $f(x) = \frac{x-2}{x-1}.$ $(f \circ f)(x) = x$ $x \neq 1.$

81. $f(x) = x - 4\sqrt{x} + 4, x \geq 0.$ $x \in [0,4]$
 $(f \circ f)(x) = x.$
82. $f(x) = \frac{1+x}{x}, g(x) = \frac{1}{x^2}$ και $h(x) = \sqrt{x-1}.$
 $(f \circ g \circ h)(x) = x,$ $x > 1.$
83. $f(x) = ax^2 + \beta x + 1$ $g(x) = x - 1,.$
 $\mu \quad \mu$, $(f \circ g)(x) = 2x^2 - 3x + 2.$
 $(: a=2 \quad \beta=1)$
84. $f(x) = ax + \beta.$ $a, \beta \in \mathbb{R}$ $(f \circ f)(x) = 4x - 3,$ $x \in \mathbb{R}.$
 $(: f(x) = 2x - 1 \quad f(x) = -2x + 3)$
85. $f(x) = ax + \beta.$ $(f \circ f)(x) = 9x + 4,$ $x \in \mathbb{R},$ $a, \beta \in \mathbb{R}.$
 $(: f(x) = 3x + 1 \quad f(x) = -3x - 2)$
86. $f(x) = x + 2\lambda + 1$ $g(x) = 3x - \lambda^2,$ $\lambda \in \mathbb{R}$ $f \circ g = g \circ f.$
 $(: \lambda = -\frac{1}{2})$
87. $f(x) = x^2 - ax + \beta - 1$ $g(x) = x + \beta, a, \beta, x \in \mathbb{R}.$
 $(f \circ g)(x) = x^2 + x - 4, x \in \mathbb{R}.$
 $(: a=5, \beta=3, \beta=-3, \beta=-1)$
88. $f(x) = \frac{ax}{x-2}.$ $\mu \quad \mu$
 $(f \circ f)(x) = x$ $x \neq 2.$ $(: a=2)$
89. $f: \mathbb{R} \rightarrow \mathbb{R},$ $(f \circ f)(x) = x^2 + x$
 $x \in \mathbb{R}.$ C_f .
90. $f: \mathbb{R} \rightarrow \mathbb{R},$ $(f \circ f)(x) = 5x - 4,$
 $x \in \mathbb{R}.$ $f(1)=1.$
91. $f: \mathbb{R} \rightarrow \mathbb{R}^*,$ $(f \circ f \circ f)(x) = x^2 - 3x,$
 $x \in \mathbb{R}^*.$ C_f $\mu \quad (4,4).$
92. $f, g: \mathbb{R} \rightarrow \mathbb{R},$
 $(f \circ g)(x) = x^2 - 5x + 9$ $(g \circ f)(3) = 3.$ C_f, C_g
 μ .
93. $f, g: \mathbb{R} \rightarrow \mathbb{R},$ $(f \circ f \circ f)(x) = x^2 - 3x + 4, x \in \mathbb{R}$ $(f \circ g)(2) = 2.$ C_f, C_g μ
 $\mu \quad A(2,2).$

94. $f, g: \mathbb{R} \rightarrow \mathbb{R}$. :
-) f, g , $g \circ f$.
 -) f , $g \circ f$.
 -) f g , $g \circ f$.
 -) f $g \circ f$, g .

95. $f: \mathbb{R} \rightarrow \mathbb{R}$ μ $(f \circ f)(x) = -x, x \in \mathbb{R}$.
-) f .
 -) $f(0) = 0$

6 :

➤ μ f μ μ

« » « μ », μ μ

f .

➤ $f \circ g$ g , f

μ $g(x) = \omega$. μ μ x μ

x , μ μ $(f \circ g)(x)$ μ $f()$, μ

μ .

➤ $f \circ g$ f , g

μ $f(x)$ x $g(x)$ μ $f(g(x))$.

μ $f(g(x))$ μ μ μ $(f \circ g)(x) = f(g(x))$

μ $g(x)$.

96. :
-) $f(x) = (x^2 - 5x + 1)^2$) $f(x) = n\mu^2x$) $f(x) = n\mu 5x$
 -) $f(x) = n\mu^2(x^2 + \sigma\nu x)$) $f(x) = 2n\mu^2x + n\mu x - 5$) $f(x) = n\mu^2 3x$

97. f , :
- I. $(f \circ g)(x) = 2x^2 - 5x + 1$ $g(x) = x + 4$.
 - II. $(f \circ g)(x) = 4x^2 + 10x + 7$ $g(x) = 2x + 3$
 - III. $(f \circ g)x = \sqrt{3x^4 + 2x^2 + 5}$ $g(x) = x^2$
 - IV. $(f \circ g)(x) = x^2 + \frac{1}{x^2} - 5$ $g(x) = x + \frac{1}{x}, x \neq 0$.
 - V. $(f \circ g)(x) = \frac{x}{x+2}$ $g(x) = \sqrt{x+1}, x \geq -1$.
 - VI. $(f \circ g)(x) = |n\mu x|$ $g(x) = \sigma\nu x$

(: . $f(x) = 2x^2 - 21x + 53, x \in \mathbb{R}$. $f(x) = x^2 - x + 1, x \in \mathbb{R}$. $f(x) = \sqrt{3x^2 + 2x + 5}, x \in \mathbb{R}$
 V. $f(x) = x^2 - 7, x \in \mathbb{R}$ VI. $f(x) = \frac{x^2 - 1}{x^2 + 1}, x \geq 0$ VII. $f(x) = \sqrt{1 - x^2}, x \in [-1, 1]$.)

98. f :
) $(f \circ g)(x) = x^2 - 2x + 3$ $g(x) = x - 1$
) $(f \circ g)(x) = 2x^2 - 5x + 1$ $g(x) = x + 4$.
) $(f \circ g)(x) = \sqrt{x^4 + 2x^2 + 3}$ $g(x) = x^2 + 1$.
 (:) $f(x) = x^2 + 2$,) $f(x) = 2x^2 - 21x + 53, x \in \mathbb{R}$,) $f(x) = \sqrt{x^2 + 2}, x \geq 1$)

99. g :
 I. $(f \circ g)(x) = 4x^2 + 6x - 2$ $f(x) = 2x - 4$.
 II. $(f \circ g)(x) = x^6 - 4x^2 + 3$ $f(x) = x + 2$
 III. $(f \circ g)(x) = x + 1$ $f(x) = \frac{x - 1}{x - 3}, x \neq 3$
 (: . $g(x) = 2x^2 + 3x + 1$. $g(x) = x^6 - 4x^2 + 1, x \in \mathbb{R}$. $g(x) = \frac{3x + 2}{x}, x \neq 0$)

100. f : μ \mathbb{R} , :
 $f(2x - 1) = x^2 - 3x + 2$ $x \in \mathbb{R}$.
 (: $f(x) = \frac{x^2 - 4x + 3}{4}, x \in \mathbb{R}$)

101. $f(x) = \frac{x + 1}{x + 2}$. g :
 $g(f(x)) = \frac{x^2 + 3x + 2}{5x^2 + 14x + 7}$.
 (: $g(x) = \frac{x}{-x^2 + 8x - 2}, x \neq -1$)

7 :

- μ $f^0 x \in y; \mathbb{N} \dots$
- μ $f(0)$ μ $x = y = 0$
- μ f μ
- $y = -x$ $x = -y$ $x = 0$ $y = 0$.
- μ $f^0 xy; \mathbb{N} \dots$ μ μ
- μ $f(1)$ μ $x = y = 1$

- $y=1$ $y=\frac{1}{x}$. μ , μ $x=1$
 μ , y μ μ .

102. $f: \mathbb{R} \rightarrow \mathbb{R}$, $f(x+y) = f(x) - f(y)$, $x, y \in \mathbb{R}$
 $f(0) = 0$) f) $f(x-y) = f(x) - f(y)$, $x, y \in \mathbb{R}$
 $) f$

103. $f: \mathbb{R} \rightarrow \mathbb{R}$, $f(x+y) = xf(y) - yf(x)$, $x, y \in \mathbb{R}$.
 $) C_f$ $\mu\mu$ f
 $) f(x-y) = yf(x) - xf(y)$, $x, y \in \mathbb{R}$.

104. $f: \mathbb{R}^* \rightarrow \mathbb{R}^*$, $f(xy) = f(x)f(y) + xy - 1$
 $x, y \in \mathbb{R}^*$.
 $) f(1) = 1$) $f\left(\frac{1}{x}\right) = \frac{1}{f(x)}$, $x \in \mathbb{R}^*$) $f\left(\frac{x}{y}\right) = \frac{f(x)}{f(y)} + \frac{x}{y} - 1$, $x, y \in \mathbb{R}^*$

105. $f: \mathbb{R}^* \rightarrow \mathbb{R}$ μ $f\left(\frac{x}{y}\right) = f(x) + f(y)$ $x, y \in \mathbb{R}^*$.
 $) f(1) = 0$) f

106. $f: \mathbb{R} \rightarrow \mathbb{R}$ $f(x+y) = 2f(x) + f(y) + 2x - y$
 $x, y \in \mathbb{R}$.
 $) \mu$ μ C_f μ $y'y$.
 $) f$.
 $(:) (0,0)$, $) f(x) = -2x$

107. $f: \mathbb{R} \rightarrow \mathbb{R}$ $f(x-y) - f(x+y) = f(x)f(y)$
 $x, y \in \mathbb{R}$.
 $) f$ f
 $) f(x) \leq 0$ $x \in \mathbb{R}$.

108. $f: \mathbb{R} \rightarrow \mathbb{R}$, $f(x+y) + f(x-y) = 4xf(y) + 3x - 6xy$, $x, y \in \mathbb{R}$.
 $) f(0)$) f .
(A : . $f(0) = 0$, . $f(x) = \frac{3}{2}x$)

115. $f: \mathbb{R} \rightarrow \mathbb{R}$:
 $f(3-x) + 2f(x-1) = x^2 + 1, \quad x, y \in \mathbb{R}.$
 (A . $f(x) = \frac{1}{3}x^2 + \frac{10}{3}x - 2$)

116. $f, g: \mathbb{R} \rightarrow \mathbb{R},$:
 $f(x) + 2f(4-3x) = 3g(x), \quad x \in \mathbb{R}.$
) f, g
) $f(x-1) + 2f(2-x) = x^2 + x \quad (1) \quad x \in \mathbb{R},$
 f, g μ
 (: $f(x) = \frac{x^2 - 13x + 10}{3}, \quad g(x) = \frac{19x^2 + 17x - 42}{9}, \quad x \in \mathbb{R}, \left(1, -\frac{2}{3}\right).$

117. $f: \mathbb{R} \rightarrow \mathbb{R},$:
 $f(x) - 2x - 3 \leq x^2 \leq f(x-1) - 2 \quad x \in \mathbb{R}.$
 (: $f(x) = x^2 + 2x + 3, \quad x \in \mathbb{R}$)

118. $f: \mathbb{R} \rightarrow \mathbb{R},$
 $f(x) + 4x - 5 \leq x^2 \leq f(x+2) - 1, \quad x \in \mathbb{R}.$
 (A . $f(x) = x^2 - 4x + 5$)

119. $f: \mathbb{R} \rightarrow \mathbb{R}$
 $x^2 f(x) \geq x^3 - x^2 \eta \mu x \quad x \in \mathbb{R}.$
 $f.$
 (: $f(x) = x - \eta \mu x, \quad x \in \mathbb{R}$)

120. $f: \mathbb{R} \rightarrow \mathbb{R},$
 $x^2 f(x) \geq x^4 \eta \mu x + x, \quad x \in \mathbb{R}.$
 $f.$
 (A . $f(x) = x^2 \cdot y \sim x + \frac{1}{x}$)