

Algebra 2

Operations and Composition of Functions

Name: KEY

Date: _____ Period: _____

1.) Given $f(x) = 2x - 5$ and $g(x) = x^2 - 7$, find

$$\begin{aligned} \text{(a)} \quad (f+g)(x) &= f(x) + g(x) \\ &= 2x - 5 + x^2 - 7 \\ &= x^2 + 2x - 12 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad (f \cdot g)(x) &= f(x) \cdot g(x) \\ &= (2x - 5)(x^2 - 7) \\ &= 2x^3 - 14x - 5x^2 + 35 \\ &= 2x^3 - 5x^2 - 14x + 35 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad (f-g)(6) &= f(6) - g(6) \\ &= 2(6) - 5 - [(6)^2 - 7] \\ &= 12 - 5 - [36 - 7] \\ &= 7 - [29] \\ &= -22 \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad 2f(x) - 3g(x) &= 2(2x - 5) - 3(x^2 - 7) \\ &= 4x - 10 - 3x^2 + 21 \\ &= -3x^2 + 4x + 11 \end{aligned}$$

2.) Given $f(x) = x^2 - 2x + 8$ and $g(x) = 3x - 5$, find

$$\begin{aligned} \text{(a)} \quad (f+g)(x) &= f(x) + g(x) \\ &= x^2 - 2x + 8 + 3x - 5 \\ &= x^2 + x + 3 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad (f \cdot g)(x) &= f(x) \cdot g(x) \\ &= (x^2 - 2x + 8)(3x - 5) \\ &= 3x^3 - 5x^2 - 6x^2 + 10x + 24x - 40 \\ &= 3x^3 - 11x^2 + 34x - 40 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad (f-g)(x) &= f(x) - g(x) \\ &= x^2 - 2x + 8 - (3x - 5) \\ &= x^2 - 2x + 8 - 3x + 5 \\ &= x^2 - 5x + 13 \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad f(3) - g(7) &= (3)^2 - 2(3) + 8 - [3(7) - 5] \\ &= 9 - 6 + 8 - [21 - 5] \\ &= 11 - 16 \\ &= -5 \end{aligned}$$

3.) Given $f(x) = x^2$ and $g(x) = 2x + 5$, find

$$\begin{aligned} \text{(a)} \quad (f+g)(x) &= f(x) + g(x) \\ &= x^2 + 2x + 5 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad (fg)(-2) &= f(-2) \cdot g(-2) \\ &= (-2)^2 \cdot [2(-2) + 5] \\ &= (4)(-4 + 5) \\ &= (4)(1) \\ &= 4 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad (f-g)(-4) &= f(-4) - g(-4) \\ &= (-4)^2 - [2(-4) + 5] \\ &= 16 - [-8 + 5] \\ &= 16 - [-3] \\ &= 19 \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad 2f(3) - 4g(1) &= 2[(3)^2] - 4[2(1) + 5] \\ &= 2(9) - 4[2 + 5] \\ &= 18 - 4[7] \\ &= 18 - 28 \\ &= -10 \end{aligned}$$

4.) Given $f(x) = 4x - 3$ and $g(x) = 2x - 5$, find

$$\begin{aligned} \text{(a)} \quad f(g(x)) &= 4x - 3 \\ &= 4(2x - 5) - 3 \\ &= 8x - 20 - 3 \\ &= 8x - 23 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad g(f(x)) &= 2x - 5 \\ &= 2(4x - 3) - 5 \\ &= 8x - 6 - 5 \\ &= 8x - 11 \end{aligned}$$

5.) Given $f(x) = x^2 - 3x$ and $g(x) = x - 3$, find

$$\begin{aligned} \text{(a)} \quad (f \circ g)(x) &= f(g(x)) \\ &= x^2 - 3x \\ &= (x-3)^2 - 3(x-3) \\ &= (x-3)(x-3) - 3(x-3) \\ &= x^2 - 3x - 3x + 9 - 3x + 9 \\ &= x^2 - 9x + 18 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad (g \circ f)(x) &= g(f(x)) \\ &= x - 3 \\ &= (x^2 - 3x) - 3 \\ &= x^2 - 3x - 3 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad f(g(1)) & \quad g(1) = 1 - 3 = -2 \\ f(-2) & \quad g(1) = 1 - 3 = -2 \\ & \quad g(1) = -2 \\ &= x^2 - 3x \\ &= (-2)^2 - 3(-2) \\ &= 4 + 6 \end{aligned}$$

$$\begin{aligned} \text{(d)} \quad (g \circ f)(2) &= g(f(2)) \\ &= g(-2) \\ &= -2 - 3 \\ &= (-2) - 3 \\ &= -5 \end{aligned}$$

$$\begin{aligned} f(2) &= 2^2 - 3(2) \\ f(2) &= 4 - 6 \\ f(2) &= -2 \end{aligned}$$

$$f(g(1)) = 10$$

$$g(f(2)) = -5$$

$$\begin{aligned} \text{(e)} \quad (f \circ f)(x) &= f(f(x)) \\ &= x^2 - 3x \\ &= (x^2 - 3x)^2 - 3(x^2 - 3x) \\ &= (x^2 - 3x)(x^2 - 3x) - 3(x^2 - 3x) \\ &= x^4 - 3x^3 - 3x^3 + 9x^2 - 3x^2 + 9x \end{aligned}$$

$$\begin{aligned} \text{(f)} \quad g(g(10)) &= \quad g(10) = 10 - 3 = 7 \\ & \quad g(10) = 7 \\ &= g(7) = 7 - 3 \\ &= 4 \end{aligned}$$

$$f(f(x)) = x^4 - 6x^3 + 6x^2 + 9x$$