

Collaboration Day- so notes first!

I will stamp homework at the end of class

Given $f(x) = 4x - x^2$

find $f(c) = 4c - c^2$
input

Composition of functions

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

1. Evaluate $g(x)$ first.
2. Then use $g(x)$ as the input for f

Examples

1. $f(x) = x^2 - 1$ and $g(x) = 3x$

a. $(f \circ g)(3)$
 $= f(3(3))$
 $= f(9)$
 $= 9^2 - 1 = 80$

b. $(g \circ f)(-2)$
 $= g(f(-2))$
 $= g((-2)^2 - 1)$
 $= g(3)$
 $= 3(3)$
 $= 9$

c. $(g \circ f)(a)$
 $= g(f(a))$
 $= g(a^2 - 1)$
 $= 3(a^2 - 1)$
 $= 3a^2 - 3$

Put answers in standard form.

2. $f(x) = -2x^2 + 3$ and $g(x) = -2x$

a. $(f \circ g)(2)$

$$\begin{aligned}
 &= f(g(2)) \\
 &= f(-2(2)) \\
 &= f(-4) \\
 &= -2(-4)^2 + 3 \\
 &= -2(16) + 3 \\
 &= -32 + 3 \\
 &= \boxed{-29}
 \end{aligned}$$

b. $(f \circ f)(0)$

$$\begin{aligned}
 &= f(f(0)) \\
 &= f(-2(0)^2 + 3) \\
 &= f(3) \\
 &= -2(3)^2 + 3 \\
 &= -2(9) + 3 \\
 &= -18 + 3 \\
 &= \boxed{-15}
 \end{aligned}$$

c. $(f \circ g)(x)$

$$\begin{aligned}
 &= f(g(x)) \\
 &= f(-2x) \\
 &= -2(-2x)^2 + 3 \\
 &= -2(4x^2) + 3 \\
 &= \boxed{-8x^2 + 3}
 \end{aligned}$$

3. $f(x) = 7 - x^2$ $g(x) = x - 3$

a) $-f(x) + 4g(x)$

$$\begin{aligned}
 &= -(7 - x^2) + 4(x - 3) \\
 &= -7 + x^2 + 4x - 12 \\
 &= \boxed{x^2 + 4x - 19}
 \end{aligned}$$

b) $(f \circ g)(x)$ *Composition*

$$\begin{aligned}
 &= f(g(x)) \\
 &= f(x - 3) \\
 &= 7 - (x - 3)^2 \\
 &= 7 - (x^2 - 6x + 9) \\
 &= 7 - x^2 + 6x - 9 \\
 &= \boxed{-x^2 + 6x - 2}
 \end{aligned}$$

c) $g(x) - f(x) + 4$

$$\begin{aligned}
 &= x - 3 - (7 - x^2) + 4 \\
 &= x - 3 - 7 + x^2 + 4 \\
 &= \boxed{x^2 + x - 6}
 \end{aligned}$$