1.5-1.6 NOTES: Function Operations and Compositions

Review: Evaluate each function for the given value of x.

Let f(x) = 3x + 4. Find f(-2).

$f(-2) = 3(-2) + 4 = \boxed{-2}$

Let g(x) = 2x² – 3x + 1. Find 3g(a + 2).

$3(2(a+2)^2 - 3(a+2) + 1)$

I. Basic Function Operations

Operation	Definition	Examples if f(x)= x + 2 and g(x) = 3x
Sum	(f + g)x = f(x) + g(x)	$(x+2) + (3x) = 4x+2$
Difference	(f – g)x = f(x) – g(x)	$(x+2) - (3x) = -2x+2$
Product	(f • g)x = f(x) • g(x)	$(x+2) * (3x) = 3x^2+6x$
Quotient	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)},\ g(x) \neq 0$	$\frac{(x+2)}{(3x)} = \frac{(x+2)}{3x}$

Given f(x) = x² -3x + 1 and g(x) = 4x + 5, find each function.

a) (f + g)(x)

$x^2 + x + 6$

b. (f – g)(x)

$x^2 - 7x - 4$

Given f(x) = x² + 5x – 1 and g(x) = 3x – 2, find each function.

a) (f • g)(x)

$(x^2+5x-1)(3x-2)$

$3x^3 + 13x^2 - 13x + 2$

b. $\left(\frac{f}{g}\right)(x)$

$\frac{x^2+5x-1}{3x-2}$

Composition of Functions—taking the output (y-value) of one function and making it the input (x-value) of another function.

Remember . . . . .
Domain: the set of all input values
Range: the set of all output values

Definition of Composition of Functions: The composition of function *f* with function *g* is written

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

START ON THE INSIDE & WORK YOUR WAY OUT!!!

***Finding a value of a composition given a function.**

1. Given f(x) = x+5 and g(x) = x² –2. Evaluate each expression.

a. f(g(3)) =

$f((3)^2 - 2)$

$f(7)$

$= (7) + 5$

$= \boxed{12}$

b. g(f(3)) =

$g((3)+5)$

$g(8)$

$= (8)^2 - 2$

$= \boxed{62}$

REMEMBER!!! = f(g(x))

NOT

Composing is NOT MULTIPLICATION!

***Finding a composition equation given functions.**

1. Given f(x) = 3x–2 and g(x) = –2x +4

Find (f ∘ g)(x).

$= 3(-2x+4) - 2$

$= \boxed{-6x+10}$

Find (g ∘ f)(x).

$(g \circ f)(x) = -2(3x-2) + 4$

$= \boxed{-6x+8}$

2. If f(x) = x² + x and g(x) = 4 – x

Find (f ∘ g)(x).

$f(g(x))$

$= (4-x)^2 + (4-x)$

$= (4-x)(4-x) + 4 - x$

$= 16 - 4x - 4x + x^2 + 4 - x = \boxed{x^2 - 9x + 20}$

Find (g ∘ f)(x).

$g(f(x)) = 4 - (x^2 + x)$

$= \boxed{-x^2 - x + 4}$

Function Composition Practice!

1. Find (f ∘ g)(x) and (g ∘ f)(x) for f(x) = x + 3 and g(x) = x² + x – 1.

2. Evaluate (f ∘ g)(x) and (g ∘ f)(x) for x = 2.

3. Find (g ∘ h)(x) and (h ∘ g)(x) if g(x) = 2x h(x) = x³ + x² + x + 1

4. If f(x) = x² – x and g(x) = x – 1, what is f(g(x))?