

# Composition of Functions

Ways to show functions are being composed:

- $f(g(x))$  *F of g of x*
- $(f \cdot g)(x)$

What does it mean to compose two functions?

*find the result of one function and apply it to the other*

*Always start with the second function inside one*

$(f \cdot g)(x)$  **DANGER:**  
**Does NOT MEAN MULTIPLY**

Example:  $f(x) = 2x+3$  and  $g(x) = x^2$

"x" is just a placeholder, and to avoid confusion let's just call it "input":

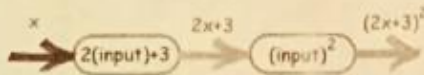
$$f(\text{input}) = 2(\text{input})+3$$

$$g(\text{input}) = (\text{input})^2$$

So, let's start:

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

First we apply  $f$ , then apply  $g$  to that result:



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

## Examples

1.  $f(x) = 3x-2$   
 $g(x) = x+5$   
 $(f \cdot g)(x) = f(g(x))$   
 $f(g(x)) = 3(x+5) - 2$   
 $f(g(x)) = 3x+15-2$   
 $f(g(x)) = 3x+13$

2.  $f(x) = 2x^2+x$   
 $g(x) = x+1$   
 $g(f(x)) = (2x^2+x)+1$   
 $= 2x^2+x+1$

$s(x) = x^2+4$   
 $t(x) = 3x-4$

$s(t(3))$   
 1.  $t(3) = 3(3) - 4 = 5$   
 2.  $s(5) = (5)^2 + 4$   
 $= 29$

$h(x) = 5x-4$   
 $k(x) = 3x^2-5$   
 $k(h(-2))$   
 1.  $h(-2) = 5(-2) - 4$   
 $= -14$   
 $k(-14) = 3(-14)^2 - 5$   
 $= 583$

The following pages are the homework assignment

Algebra 2

Name \_\_\_\_\_ ID: 1

## Function Compositions Practice

Date \_\_\_\_\_ Period \_\_\_\_\_

Perform the indicated operation.

1)  $g(n) = 2n + 1$   
 $f(n) = 2n - 2$   
Find  $g(f(n))$

2)  $g(x) = 2x - 5$   
 $f(x) = 2x^2 - 2$   
Find  $g(f(x))$

3)  $f(x) = 3x - 2$   
 $g(x) = x^3 + 5x^2$   
Find  $f(g(x))$

4)  $h(x) = -2x - 1$   
 $g(x) = x^3 - 3x^2$   
Find  $h(g(x))$

5)  $g(t) = 4t - 2$   
 $h(t) = 2t - 5$   
Find  $g(h(t))$

6)  $f(n) = 2n + 3$   
 $g(n) = n^2 - 2$   
Find  $f(g(n))$

7)  $h(x) = 3x$   
Find  $h(h(x))$

8)  $g(t) = t^2$   
 $f(t) = 4t - 1$   
Find  $g(f(t))$

9)  $g(x) = 4x - 3$   
 $f(x) = 2x^2 - 1$   
Find  $g(f(x))$

10)  $g(x) = x + 4$   
 $h(x) = -4x + 1$   
Find  $g(h(x))$

11)  $g(x) = x^2 + 5x$   
 $f(x) = -3x + 2$   
Find  $g(f(x))$

12)  $h(x) = x^2 + 4$   
 $g(x) = 2x - 4$   
Find  $h(g(x))$

13)  $g(n) = n^2 - 3n$   
 $h(n) = n + 3$   
Find  $g(h(n))$

14)  $g(n) = 4n + 2$   
 $f(n) = 3n + 2$   
Find  $g(f(n))$

15)  $g(x) = x - 5$   
 $h(x) = x^3 - 1$   
Find  $g(h(-2))$

16)  $h(x) = 4x + 1$   
 $g(x) = -3x^3 + 3 + 2x$   
Find  $h(g(-1))$

17)  $f(a) = a + 3$   
Find  $f(f(-1))$

18)  $h(n) = 4n + 4$   
 $g(n) = 2n + 4$   
Find  $h(g(-8))$

19)  $g(x) = x^2 - 4x$   
 $f(x) = x - 1$   
Find  $g(f(1))$

20)  $g(x) = 3n - 3$   
 $f(n) = n + 3$   
Find  $g(f(4))$