

Composite Function

If f and g are functions, the composite function $f \circ g$ ("f composed with g") is defined by

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

The domain of the composite function consists of numbers x in the domain of function g for which $g(x)$ lies in the domain of function f .

Example 1: If $f(x) = \sqrt{x}$ and $g(x) = x + 1$ find the following:

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

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

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

d) $(g \circ g)(x)$

Operations with Function

Operation	Notation	Alternative Notation	Domain	Range
Addition				
Subtraction				
Multiplication				
Division				
Composition				

Example 2: Find the domains and ranges of $f, g, f + g$ and $f \cdot g$.

a) $f(x) = x$ and $g(x) = \sqrt{x - 1}$

b) $f(x) = \sqrt{x + 1}, g(x) = \sqrt{x - 1}$

Example 3: If $f(x) = x + 5$ and $g(x) = x^2 - 3$, find the following:

$f(g(0))$		$g(f(0))$	
$f(g(x))$		$g(f(x))$	
$f(f(-5))$		$g(g(2))$	
$f(f(x))$		$g(g(x))$	

Example 4: If $f(x) = \sqrt{x}$ and $g(x) = \frac{4}{x}$, $h(x) = 4x - 8$, find the following:

$h(g(f(x)))$		$g(f(h(x)))$	
$f(h(g((x))))$		$f(g(h(x)))$	

Example 5: Write the formula for $f(g(x))$ and $g(f(x))$ and find the domain and range of each:

a) $f(x) = \sqrt{x+1}$ and $g(x) = \frac{1}{x}$.

b) $f(x) = x^2$ and $g(x) = 1 - \sqrt{x}$