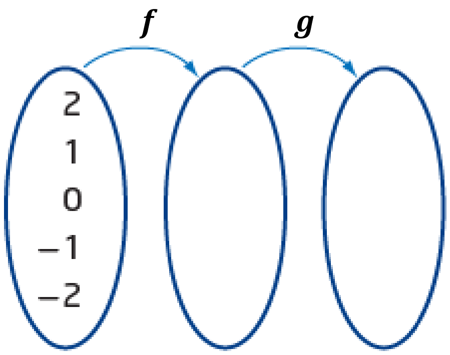
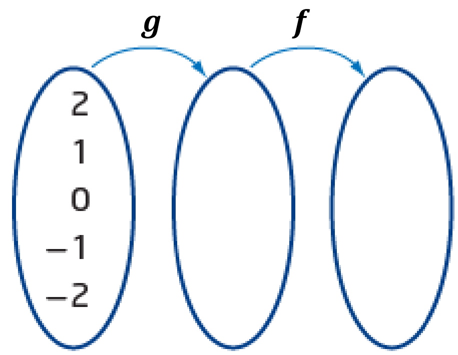
Unit 10: Function Operations
10.3 Composite Functions

Consider the functions $f(x) = 2x$ and $g(x) = x^2 + 2$. The output values of a function can become the input values for another function. Complete the mapping diagram below.





Recall Function Notation:

If $f(x) = 2x$ then,

$f(-6) =$ $f(m) =$ $f(\text{☺}) =$ $f(5x) =$

$$f(x^2 + 2) =$$

Substituting one function into another is called **composition of functions** and results in a **composite function**.

Notation:

Ex. Use the functions: $f(x) = 4x$; $g(x) = x - 2$; and $h(x) = x^2$ to determine:

a) $f(g(x)) =$

b) $g(f(x)) =$

c) $(g \circ h)(x) =$

d) $(g \circ h)(-2) =$

e) $h(h(x)) =$

f) $h(h(2)) =$

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

a) Determine $(f \circ g)(x)$ and $(g \circ f)(x)$.

b) Determine the domain of $f(x), g(x)$, $(f \circ g)(x)$, and $(g \circ f)(x)$.

Ex. If $h(x) = f(g(x))$, determine $f(x)$ and $g(x)$.

a) $h(x) = (x-2)^2 + (x-2) + 1$

b) $h(x) = \sqrt{x^3 + 1}$

Ex. Use the graphs of $f(x)$ and $g(x)$ to find:

a) $f(-1) =$

b) $g(0) =$

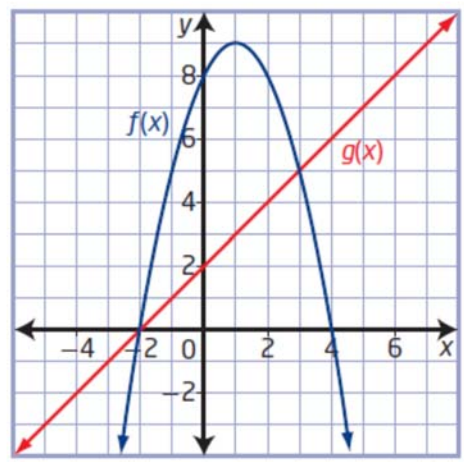
c) $f(g(0)) =$

d) $g(f(0)) =$

e) $(g \circ g)(1) =$

f) $(f \circ f)(-1) =$

g) $(f \circ f \circ g \circ g)(0) =$



Recall the inverse function $f^{-1}(x)$:

Ex. Use the function $f(x) = 4x + 3$ to find:

a) $f^{-1}(x)$

b) $f(f^{-1}(x))$

c) $f^{-1}(f(x))$

Practice: pg. 507/ # 1 – 12, 14, 17, 19, 20, C2