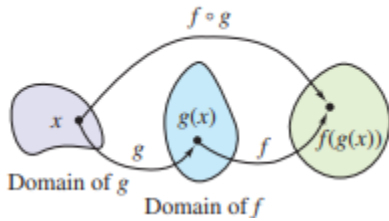


1.9 Composite Function Notes

Composition of Two Functions: The composition of the function f with the function g is

$$(f \circ g)(x) = f(g(x)). \text{ (f of g of x)}$$

The domain of $f \circ g$ is the set of all x in the domain of g such that $g(x)$ is in the domain of f .



** Substitute “inside” function for all variables in “outside” function and simplify.

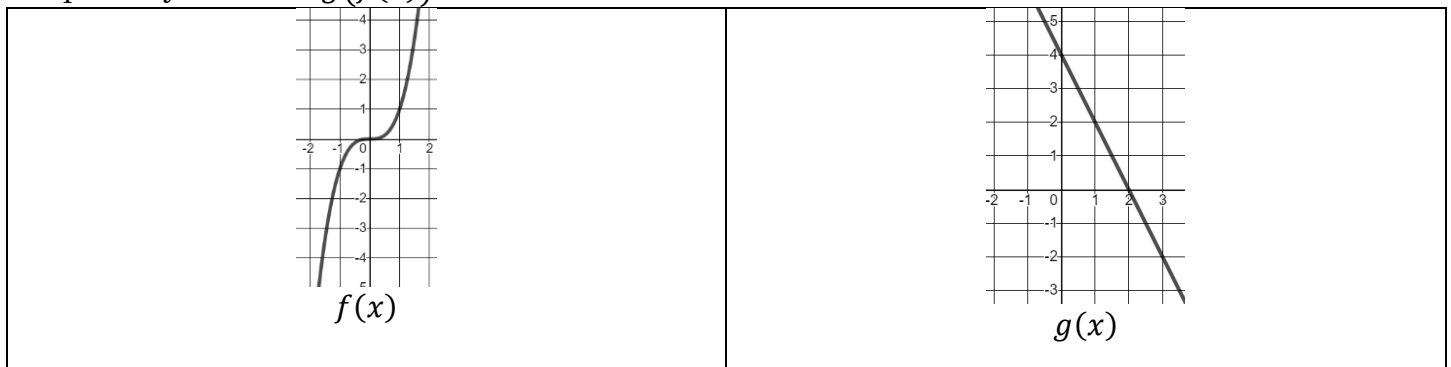
Examples: Find $(f \circ g)(x)$ and $(g \circ f)(x)$ for each of the following pairs of functions.

1. $f(x) = 1 - x^2; g(x) = \sqrt{x}$	$(f \circ g)(x) = f(g(x)) = 1 - (\sqrt{x})^2$
	$(g \circ f)(x) = g(f(x)) = \sqrt{1 - x^2}$
2. $f(x) = \frac{2x-1}{x+3}; g(x) = \frac{3x+1}{2-x}$	$(f \circ g)(x) = f(g(x)) = \frac{2\left(\frac{3x+1}{2-x}\right) - 1}{\left(\frac{3x+1}{2-x}\right) + 3} = x$
	$(g \circ f)(x) = g(f(x)) = \frac{3\left(\frac{2x-1}{x+3}\right) + 1}{2 - \left(\frac{2x-1}{x+3}\right)} = x$

Now you try:

1. Given: $f(2) = 3, f(3) = 4,$ $g(3) = 2, g(2) = 5,$ find $f(g(3))$	2. $f(x) = 2x^3 - 3x^2 + 4x - 2$ and $g(x) = x^2 - 5,$ find $f(g(2))$
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Graphically: What is $g(f(1))$?



$$f(1) = 1, g(f(1)) = g(1) = 2$$