TOPIC: FUNCTION COMPOSITION

Function Composition

- Function composition is like evaluating, but you replace the inside variable of a function with ***ANOTHER*** _____.

EVALUATING a Function	COMPOSING a Function
$f(x) = x^2 + 3x - 10$ $f(7) = (\quad)^2 + 3(\quad) - 10$ $=$ Result is a **[NUMBER | FUNCTION]**	$f(x) = x^2 + 3x - 10$ $g(x) = x - 2$ $f(g(x)) = (\quad)^2 + 3(\quad) - 10$ $=$ Result is a **[NUMBER | FUNCTION]**

Note: $f(g(x))$ is often written as _____. First letter = outside function, second letter = inside function

EXAMPLE: Given the functions $f(x) = x + 4$ and $g(x) = x^2 - 3$, find the following composite functions (fully simplify your answer).

(A) $f(g(x)) =$

(B) $g(f(x)) =$

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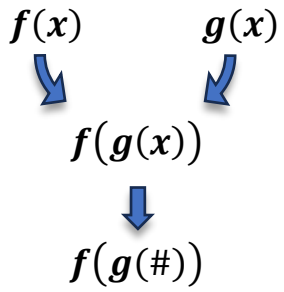
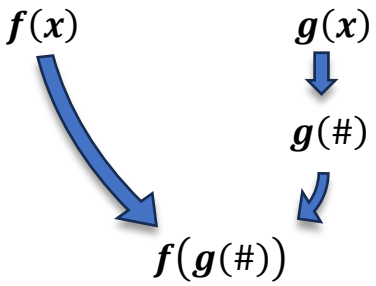
PRACTICE: Given the functions $f(x) = \sqrt{x+4}$ and $g(x) = (x-2)^2 - 4$, (A) find $(f \circ g)(x)$ and (B) $(g \circ f)(x)$.

PRACTICE: Given the functions $f(x) = \frac{1}{x^2-2}$ and $g(x) = \sqrt{x+2}$, (A) find $(f \circ g)(x)$ and (B) $(g \circ f)(x)$.

TOPIC: FUNCTION COMPOSITION
Evaluating Composed Functions

- You may have to compose functions and ***then*** _____ at a specific value, $f(g(\#))$. Two common methods:

Method 1: Compose → Evaluate *Use when first asked to find* $f(g(x))$	**Method 2: Evaluate inside → Evaluate outside**
	
EXAMPLE: For $f(x) = x^2$ and $g(x) = x - 1$, find $f(g(x))$ and then evaluate $f(g(3))$	EXAMPLE: For $f(x) = x^2$ and $g(x) = x - 1$, evaluate $f(g(3))$

PRACTICE: Given the functions $f(x) = x + 3$ and $g(x) = x^2$, (**A**) find $(f \circ g)(2)$ and (**B**) $(g \circ f)(2)$.

TOPIC: FUNCTION COMPOSITION
Domain Of Composite Functions

- To find the **domain** of a composite function, follow these steps to exclude x-values from $\boldsymbol{f \circ g(x)}$:

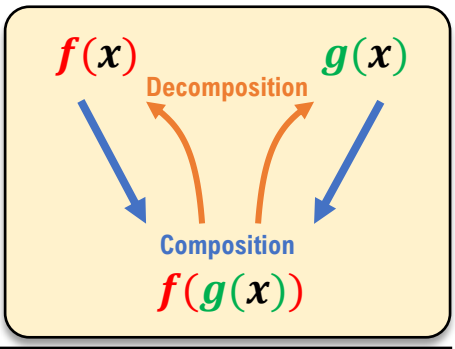
  1) Find any x-values not defined for _____

  2) Find any x-values that make $g(x)$ not defined for _____

EXAMPLE: Given the functions $\boldsymbol{f(x) = \frac{1}{x-2}}$ and $\boldsymbol{g(x) = \sqrt{x}}$, determine $\boldsymbol{f \circ g(x)}$ and its domain.

PRACTICE: Given the functions $\boldsymbol{f(x) = x^2}$ and $\boldsymbol{g(x) = \sqrt{x-8}}$ find $(\boldsymbol{f \circ g})(\boldsymbol{x})$ and determine its domain.

TOPIC: FUNCTION COMPOSITION
Decomposing Functions



- Function decomposition is the _____ of function composition.
  - There are many correct answers when decomposing functions.

EXAMPLE: Express the function $h(x) = \sqrt{x-2}$ as a composition of two functions f & g so that $h(x) = (f \circ g)(x)$.

PROBLEM: Express the function $h(x) = \frac{1}{x^2+3x-10}$ as a composition of two functions f & g so that $h(x) = (f \circ g)(x)$.