Warm-up 8/17/15

1) $\frac{2}{x} + 3 =$

2) $\frac{x+7}{2} - \frac{x}{x-2} =$

3) $\frac{1}{2}(x + 6) - 7 =$

4) $(x + 1)^2 - 2(x + 1) - 1 =$

5) $Simplify\ \sqrt{50}$

6) Solve for x
$x^2 \geq 25$

Composition of Functions
1.2

Given
$f(x) = 3x^2 + 5$
$g(x) = 2x - 1$

1) Solve for $f(x) + g(x)$

Given	$f(x) = 3x^2 + 5$ $g(x) = 2x - 1$
Perform the operation	$f(x) + g(x) =$ $(3x^2 + 5) + (2x - 1) =$
Simplify	$3x^2 + 2x + 5 - 1$ $3x^2 + 2x + 4$

2) Solve for $f(x) - g(x)$

Given	$f(x) = 3x^2 + 5$ $g(x) = 2x - 1$
Perform the operation	$f(x) - g(x) =$ $(3x^2 + 5) - (2x - 1) =$
Simplify	$3x^2 - 2x + 5 + 1$ $3x^2 - 2x + 6$

3) Solve for $\frac{f(x)}{g(x)}$

Given	$f(x) = 3x^2 + 5$ $g(x) = 2x - 1$
Perform the operation	$\frac{f(x)}{g(x)} =$ $\frac{(3x^2 + 5)}{(2x - 1)}$
What can x not be?	$2x - 1 \neq 0$ $2x \neq 1$ $x \neq \frac{1}{2}$ Final answer: $\frac{(3x^2+5)}{(2x-1)}, x \neq \frac{1}{2}$

4) Solve for $f(x) \cdot g(x)$

Given	$f(x) = 3x^2 + 5$ $g(x) = 2x - 1$
Perform the operation	$f(x) \cdot g(x) =$ $(3x^2 + 5) \cdot (2x - 1) =$
Simplify	$(3x^2 + 5) \cdot (2x - 1) =$ $6x^3 - 3x^2 + 10x - 5$

We Try:

Given :

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

Solve for $f(x) \cdot g(x)$

Given	$g(x) = x^3 + 2x + 1$ $f(x) = x^2 - 3x - 4$
Perform the operation	$f(x) \cdot g(x) =$
Simplify	

Solve for $\frac{f(x)}{g(x)}$

Given	$g(x) = x^3 + 2x + 1$ $f(x) = x^2 - 3x - 4$
Perform the operation	$\frac{f(x)}{g(x)} =$
Simplify	
What can x not be?	

Solve for $f(x) - g(x)$

Given	$g(x) = x^3 + 2x + 1$ $f(x) = x^2 - 3x - 4$
Perform the operation	$f(x) - g(x) =$
Simplify	

We Try with your partner

Given :

$$g(x) = x^3 - 1$$

$$f(x) = \frac{x^2}{2}$$

1) Solve for $f(x) \cdot g(x)$
2) Solve for $\frac{f(x)}{g(x)}$
3) Solve for $f(x) - g(x)$

Functions can be combined using **composition**. In a composition a function is performed, and then a second function is performed on the result of the first function.

Composition of Functions	Given functions f and g, the composite function $f \circ g$ can be described by the following equation. $[f \circ g](x) = f(g(x))$ The domain of $f \circ g$ includes all of the elements x in the domain of g for which $g(x)$ is in the domain of f.

I do:

Find $[f \circ g](x)$ *and* $[g \circ f](x)$

$f(x) = 2x + 5$
$g(x) = x^2 - 4$

$[f \circ g](x)$

Given	$f(x) = 2x + 5$ $g(x) = x^2 - 4$
Combine by substitution	$[f \circ g](x) = f\left(g(x)\right) = f(x^2 - 4) =$ $2(x^2 - 4) + 5$
Simplify	$2x^2 - 8 + 5 =$ $2x^2 - 3$

$[g \circ f](x)$

Given	$f(x) = 2x + 5$ $g(x) = x^2 - 4$
Combine by substitution	$[g \circ f](x) = g\left(f(x)\right) = g(2x + 5) =$ $(2x + 5)^2 - 4$
Simplify	$4x^2 + 10x + 10x + 25 - 4$

	$4x^2 + 20x + 21$

We Try:

$f(x) = 3x + 5$

$g(x) = x^2 - 1$

$Solve\ for\ [f \circ g](x)$

Given	$f(x) = 3x + 5$ $g(x) = x^2 - 1$
Combine by substitution	
Simplify	

$Solve\ for\ [g \circ f](x)$

Given	$f(x) = 3x + 5$ $g(x) = x^2 - 1$
Combine by substitution	
Simplify	

You try with your partner:

$f(x) = 2x$

$g(x) = 3x^2 + x - 3$

$Solve\ for\ [f \circ g](x)$ and $[g \circ f](x)$

State the domain of $[f \circ g](x)\ for$

$$f(x) = \sqrt{x-4}$$

$$g(x) = \frac{1}{x^2}$$

Given	$f(x) = \sqrt{x-4}$ $g(x) = \frac{1}{x^2}$
Find the individual domains	$f(x) = \sqrt{x-4}$, $\boldsymbol{x \geq 4}$ $g(x) = \frac{1}{x^2}$, $\boldsymbol{x \neq 0}$
For $[f \circ g](x) = f(g(x))$ $look\ at\ the\ inside\ function\ first$ for the first restrictions	$For\ g(x), x \neq 0$
Set the inside function with the domain for the outside function.	$g(x) = \frac{1}{x^2}$ domain of $f(x)\ is\ x \geq 4$ $\frac{1}{x^2} \geq 4$
Solve for x	$\frac{1}{x^2} \geq 4$ $1 \geq 4x^2$ $\frac{1}{4} \geq x^2$

	$\frac{1}{2} \geq \lvert x \rvert$ $\frac{1}{2} \geq x, \quad x \geq -\frac{1}{2}$

We Try:

State the domain of $[g \circ f](x)\ for$

$$f(x) = \sqrt{x-4}$$
$$g(x) = \frac{1}{x^2}$$

Given	$f(x) = \sqrt{x-4}$ $g(x) = \frac{1}{x^2}$
Find the individual domains	
For $[g \circ f](x)$= $g(f(x))$ *look at the inside function first for the first restriction.*	
Set the inside function with the domain for the outside function.	
Solve for x	

You Try with your partner:

$$Find\ the\ domain\ and\ range\ of\ [f \circ g](x)\ for$$
$$f(x) = \sqrt{x-3}$$
$$g(x) = \frac{1}{x+2}$$

Find the first three iterates, x_1, x_2, x_3 of the function $f(x) = 2x - 3$, for an initial value of $x_0 = 1$.

Given	$f(x) = 2x - 3$ $x_0 = 1$
First iteration	$x_1 = f(x_0) = f(1) = 2(1) - 3 = -1$
Second iteration	$x_2 = f(x_1) = f(-1) = 2(-1) - 3 = -5$
Third iteration	$x_3 = f(x_2) = f(-5) = 2(-5) - 3 = -13$

We try:

Find the first three iterates, x_1, x_2, x_3 of the function $f(x) = x^2 + 1$, for an initial value of $x_0 = 1$.

Given	$f(x) = 2x - 3$ $x_0 = 1$
First iteration	$x_1 = f(x_0) =$
Second iteration	$x_2 = f(x_1) =$
Third iteration	$x_3 = f(x_2) =$

You try with your partner:

Find the first three iterates, x_1, x_2, x_3 of the function $f(x) = x^3 - 2x$, for an initial value of $x_0 = -1$.

Closure: Work with your partner and be ready to share with the class.

1. Solve for $[f \circ g](x)$
Given
$f(x) = -x + 1$
$g(x) = x^2 - 2$

2. Solve for $[f - g](x)$
Given
$$f(x) = \frac{-x + 1}{x + 2}$$
$g(x) = x^2 - 2$

3. *Given*: $f(x) = \sqrt{-20 + (-x)^3}$, find $f(-4)$.