Composition of Functions and Function Operations
Day 2

Goals:

Students should be able to take the composition of a function.

Warm-up

$f(x) = x^2 + 6$ $g(x) = \sqrt{x + 3}$

Find f(3) and g(x+6)

$3^2+6=15$

$\sqrt{x+6+3}$

$\sqrt{x+9}$

Combination and Composition of Functions---

Can the g°f see through the f°g?

f°g = f(g(x)) aka plug g(x) in for "x" in f(x)

g°f = g(f(x)) aka plug f(x) in for "x" in g(x)

Composition of Functions - combine two functions to create a new function by substituting an entire function into another function.

Notation: $(f \circ g)(x)$ *and* $f(g(x))$ **mean exactly the same thing mathematically.**

What do you need to do?????????????

Replace all x's in f(x) with the g(x) function

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

$f(g(x))$

$(x+5)^2 = (x+5)(x+5)$

Step 1: $f(x) = x^2 - 2$

Step 2: $f(\ldots\ldots) = (\ldots\ldots)^2 - 2$

Step 3: $f(x+5) = (x+5)^2 - 2$

Step 4: $f(x+5) = x^2 + 10x + 25 - 2$

Step 5: $f(x+5) = x^2 + 10x + 23$

or

$f(g(x)) = x^2 + 10x + 23$

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

$f(x) = x^2 + 6 \quad g(x) = \sqrt{x+3}$

$f(x) = x^2 + 6$

$f(\quad) = (\quad)^2 + 6$

$f(\sqrt{x+3}) = (\sqrt{x+3})^2 + 6$

$= x + 3 + 6$

$\boxed{f(g(x)) = x + 9}$

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

$f(x) = x^2 + 6 \quad g(x) = \sqrt{x+3}$

$g(x) = \sqrt{x+3}$

$g(\quad) = \sqrt{(\quad)+3}$

$g(x^2+6) = \sqrt{(x^2+6)+3}$

$\boxed{g \circ f = \sqrt{x^2+9}}$

Find f(g(3))

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

$g(3) = 5(3) - 1$
$= 14$

$f(14) = 2(14)^2 - 3(14)$
$= 2(196) - 3(14)$
$= 392 - 42$
$= 350$

$f(x) = 2x^2 - 3x$
$f(\ \ ) = 2(\ \ )^2 - 3(\ \ )$
$f(5x-1) = 2(5x-1)^2 - 3(5x-1)$
$f(5x-1) = 2(25x^2 - 10x + 1)$
$- 3(5x-1)$

Find g(f(x))

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

Given f(x) and g(x) find the following:

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

$h(x) = x + 2$ $r(x) = x^2 + 5x + 6$

Find ① $f(r(x))$; ② $h(g(x))$;

③ $h \circ f$; ④ $g \circ f$

HW:

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