Lesson 1.10 Objective: SWBAT find the composition of functions.

Kickoff

Given $2y + 3x + 4 = 0$ find the equation of the line perpendicular and that passes through (-3, 5) in general form.

$2y + 3x + 4 = 0$
$-3x - 4 \quad -3x - 4$
$2y = -3x - 4$
$y = -\frac{3}{2}x - 2$

$m = \frac{2}{3}$

$y - y_1 = m(x - x_1)$
$y - 5 = \frac{2}{3}(x + 3)$
$y - 5 = \frac{2}{3}x + 2$
$-y + 5 \quad -y + 5$

$3\left(0 = \frac{2}{3}x - y + 7\right)$
$0 = 2x - 3y + 21$

Compositions of Functions- Substitute a function into a function.

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

Examples: Given $f(x) = 3x - 2$ and $g(x) = x^2 - 3$ find each of the following:

1) $(f \circ g)(-3)$

$g(-3) = (-3)^2 - 3 = 6$
$f(6) = 3(6) - 2 = 16$

2) $(g \circ f)(2)$

$f(2) = 3(2) - 2 = 4$
$g(4) = (4)^2 - 3 = 13$

3) $g(f(-4))$

$f(-4) = 3(-4) - 2 = -14$
$g(-14) = (-14)^2 - 3 = 193$

4) $f(g(6))$

$g(6) = 6^2 - 3 = 33$
$f(33) = 3(33) - 2 = 97$

Examples: Given $f(x) = 2x - 1$ and $g(x) = 2x^2 - 3x$ find each of the following:

5) $f \circ g(x)$ Letters = Left!

$2(2x^2 - 3x) - 1$
$4x^2 - 6x - 1$

6) $g(f(x))$

$2(2x - 1)^2 - 3(2x - 1)$
$2(2x - 1)(2x - 1) - 6x + 3$
$2(4x^2 - 2x - 2x + 1) - 6x + 3$
$8x^2 - 4x - 4x + 2 - 6x + 3$
$8x^2 - 14x + 5$

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1) If $f(x) = 5x^2 - 1$ and $g(x) = 3x - 1$, find g(f(1)).

$f(1) = 5(1)^2 - 1$
$f(1) = 4$ $g(4) = 3(4) - 1$ $g(4) = 11$

3) If $f(x) = 2x - 5$ and $g(x) = \sqrt{x}$, evaluate (f ∘ g)(36).

$g(36) = \sqrt{36} = 6$
$f(6) = 2(6) - 5 = 7$

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5) If $f(x) = x^2 + 4$ and $g(x) = 2x + 3$, find f(g(-2)).

$2(-2) + 3$ $(-1)^2 + 4$
$-4 + 3 = -1$ $1 + 4 = 5$

7) If $f(x) = 2^x - 1$ and $g(x) = x^2 - 1$, find (f ∘ g)(3).

$g(3) = 3^2 - 1 = 8$
$f(8) = 256 - 1 = 255$

9) If $f(x) = 3x - 5$ and $g(x) = x - 9$, find $(f \circ g)(x)$.

$f(x) = 3(x-9) - 5$

$f(x) = 3x - 27 - 5$

$f(x) = 3x - 32$

11) If $f(x) = 3x + 5$ and $g(x) = x^2 + 1$, find $g(f(x))$.

$(3x+5)^2 + 1$

$9x^2 + 30x + 26$

13) If $f(x) = 2x - 1$ and $g(x) = 3x + 5$, find $(f \circ g)(x)$

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

$= 6x + 10 - 1$

$= 6x + 9$

15) Given: $f(x) = \sqrt{2x + 5}$ and $g(x) = 6x - 3$,
     a. Find $g(f(10))$
     b. Find $(f \circ g)(x)$.

$f(10) = \sqrt{2(10) + 5} = 5$

$g(5) = 6(5) - 3 = 27$