

Lesson 1.11-Objective- SWBAT find the compositions of functions.

Kickoff- Simplify each of the following

1) $\frac{5x^2 - 10x^4}{10x^3}$

$$\frac{5x^{\cancel{2}} - 10x^{\cancel{4}}}{10x^{\cancel{3}}}$$

$$\frac{1}{2}x - x$$

2) $\frac{6a^2bc^3 - 4abc^2 + 2abc}{2a^2b^2c^2}$

$$\frac{6a^{\cancel{2}}bc^{\cancel{3}} - 4\cancel{a}bc^{\cancel{2}} + 2\cancel{a}bc}{2\cancel{a}^{\cancel{2}}b^{\cancel{2}}c^{\cancel{2}}}$$

* $\frac{3c}{b} - \frac{2c}{bc} + \frac{1}{abc}$

Composition of Functions- The application of one function follows that of another. (Applying one function to another)

Notation: Compositions are shown as $f(g(x))$ when you have two functions, $f(x)$ and $g(x)$

However, the most important thing is that you complete the INSIDE function first and then continue to the OUTSIDE function.

$f(2)$

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

1) $f(1)$

$f(1) = 2(1) - 1 = 1$

2) $f(g(-2))$

$g(-2) = 2(-2)^2 - 3 = 5$

$f(5) = 2(5) - 1 = 9$

3) $g(f(-5))$

$f(-5) = 2(-5) - 1 = -11$

$g(-11) = 2(-11)^2 - 3 = 245$

4) $f(g(4))$

$g(4) = 2(4)^2 - 3 = 29$

$f(29) = 2(29) - 1 = 57$

However, we can also complete compositions of functions without evaluating. To do this, you substitute the INSIDE function for every time you see x in the OUTSIDE function.

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

5) $f(g(x))$

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

$4x^2 - 6x - 1$

6) $g(f(x))$

Practice:

7) If $f(x) = 3x$ and $g(x) = x - 4$, find $g(f(-2))$

$f(-2) = 3(-2) = -6$

$g(-6) = (-6) - 4 = -10$

8) If $h(x) = x^2$ and $r(x) = x + 3$, find $h(r(-5))$

$r(-5) = (-5) + 3 = -2$

$h(-2) = (-2)^2 = 4$

9) If $j(x) = x^2 + 3$ and $a(x) = 2x - 10$ find $j(a(3))$

$a(3) = 2(3) - 10 = -4$

$j(-4) = (-4)^2 + 3 = 19$

10) If $f(x) = 2x - 6$ and $g(x) = x + 4$ find $f(g(x))$

11) If $b(x) = x^2$ and $c(x) = x + 1$, find $c(b(x))$

$$\begin{aligned} & c(x^2) + 1 \\ & x^2 + 1 \end{aligned}$$

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

$$\begin{aligned} & 2(x^2 - 1) + 5 \\ & 2x^2 - 2 + 5 \\ & 2x^2 + 3 \end{aligned}$$