7.7. Advanced Algebra
Operations on Functions

DATE: 1/29

Target 6B. Perform operations on polynomial functions.

A polynomial equation used to represent a function is called a **polynomial function.**

Examples:

$f(x) = 4x^2 - 5x + 2$
$p(x) = 2x^3 + 4x^2 - 5x + 7$
$g(x) = 3x - 4$

The sum, diff, product, or quotient of two functions is another function.

Operations with Functions

Operation	Definition	Examples if $f(x) = x + 2$, $g(x) = 3x$
Sum	$(f+g)(x) = f(x) + g(x)$	$(x+2) + 3x = 4x+2$
Difference	$(f-g)(x) = f(x) - g(x)$	$(x+2) + 3x = -2x+2$
Product	$(f \cdot g)(x) = f(x) \cdot g(x)$	$(x+2) \cdot 3x = 3x^2+6x$
Quotient	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, g(x) \neq 0$	$\frac{x+2}{3x}$, $3x \neq 0 \Rightarrow x \neq 0$ (More on ÷ later)

Given $h(x) = x^2 - 3x + 1$ and $k(x) = 4x + 5$, find each function.

5. $(h + k)(x)$ "h plus k of x"

$(h+k)(x) = h(x) + k(x)$

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

$x^2 - 3x + 1$

$4x + 5$

$x^2 + 1x + 6$

So $(h+k)(x) = x^2 + x + 6$

6. $(k - h)(x)$ "k minus h of x"

$(k-h)(x) = k(x) - h(x)$

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

$4x + 5$

$-x^2 + 3x - 1$

$-x^2 + 7x + 4$

So $(k-h)(x) = -x^2 + 7x + 4$

7. $(h \cdot k)(x)$ "h times k of x"

7. $\left(\frac{h}{k}\right)(x)$ "h divided by k of x"

7. $(h \cdot k)(x)$ "h times k of x"

$(h \cdot k)(x) = h(x) \cdot k(x)$

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

	x^2	$-3x$	$+1$
$4x$	$4x^3$	$-12x^2$	$4x$
$+5$	$5x^2$	$-15x$	5

So,

$(h \cdot k)(x) = 4x^3 - 7x^2 - 11x + 5$

7. $\left(\frac{h}{k}\right)(x)$ "h divided by k of x"

$\left(\frac{h}{k}\right)(x) = \frac{h(x)}{k(x)} = \frac{x^2 - 3x + 5}{4x + 5}$

$4x + 5 \neq 0 \Rightarrow x \neq -\frac{5}{4}$.

More on this later!

$4x + 5 = 0$

$4x = -5$

$x = \frac{-5}{4}$

Given $f(x) = 3x^2 + 7x$ ***and*** $g(x) = 2x^2 - x - 1$, ***find each function.***

8. $(g + f)(x)$

Try it!

Ans: $5x^2 + 6x - 1$

9. $(g - f)(x)$

Try it!

Ans: $-x^2 - 8x - 1$

8. $(g+f)(x)$

9. $(g-f)(x)$

Try it!

Ans: $6x^4+11x^3-10x^2-7x$

10. $(f\cdot g)(x)$

	$2x^2$	$-x$	-1
$3x^2$	$6x^4$	$-3x^3$	$-3x^2$
$7x$	$14x^3$	$-7x^2$	$-7x$