

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 $f(x) = x + 2$, $g(x) = 3x$
<i>Sum</i>	$(f + g)(x) = f(x) + g(x)$	$(x + 2) + 3x = 4x + 2$
<i>Difference</i>	$(f - g)(x) = f(x) - g(x)$	$(x + 2) - 3x = -2x + 2$
<i>Product</i>	$(f \cdot g)(x) = f(x) \cdot g(x)$	$(x + 2) \cdot 3x = 3x^2 + 6x$
<i>Quotient</i>	$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, g(x) \neq 0$	$\frac{x + 2}{3x}, 3x \neq 0 \Rightarrow x \neq 0$

More on ÷ later

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

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

$$\begin{aligned}(h+k)(x) &= h(x) + k(x) \\ &= (x^2 - 3x + 1) + (4x + 5)\end{aligned}$$

$$\begin{array}{r}x^2 - 3x + 1 \\ 4x + 5 \\ \hline x^2 + 1x + 6\end{array}$$

$$\text{So } (h+k)(x) = x^2 + x + 6$$

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

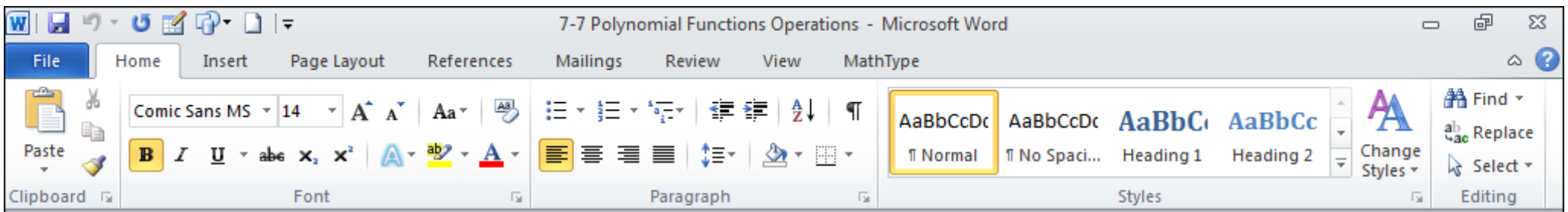
$$\begin{aligned}(k-h)(x) &= k(x) - h(x) \\ &= (4x + 5) - (x^2 - 3x + 1)\end{aligned}$$

$$\begin{array}{r}4x + 5 \\ -x^2 + 3x - 1 \\ \hline -x^2 + 7x + 4\end{array}$$

$$\text{So } (k-h)(x) = -x^2 + 7x + 4$$

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

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

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

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

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