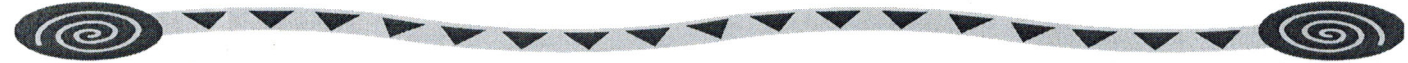# Honors Advanced Algebra

DATE: __9/23__

Operations on Functions

Target 2C. Add, subtract, and multiply polynomials and explain why solutions are equivalent

A polynomial equation used to represent a function is called a **polynomial function.**
Examples:
$$f(x) = 4x^2 - 5x + 2$$
$$p(x) = 2x^3 + 4x^2 - 5x + 7$$
$$g(x) = 3x - 4$$

Evaluating Polynomials
Find each value if $f(x) = 4x - 7$ and $g(x) = 2x^2 - 3x + 1$

" Replace every x in the function with value of expression "

1. $f(-3)$ "f of -3"

$$f(-3) = 4(-3) - 7 = -12 - 7 = \boxed{-19}$$

2. $g(2a)$ "g of 2a"

$$g(\ ) = 2(2a)^2 - 3(2a) + 1 = 2 \cdot 2^2 a^2 - 6a + 1$$
$$= 2 \cdot 4a^2 - 6a + 1$$
$$= \boxed{8a^2 - 6a + 1}$$

3. $f(g(1))$ "f of g of 1"

Find $g(1)$ first!

$$g(1) = 2(1)^2 - 3(1) + 1$$
$$= 2 - 3 + 1$$
$$= 0$$
$$\therefore g(1) = 0$$

Last find $f(0)$.

$$f(0) = 4(0) - 7$$
$$= 0 - 7$$
$$= \boxed{-7}$$

4. $g(f(1))$ "g of f of 1"

Find $f(1)$ first.

$$f(1) = 4(1) - 7$$
$$= 4 - 7$$
$$= -3$$

Last find $g(-3)$.

$$g(-3) = 2(-3)^2 - 3(-3) + 1$$
$$= 2 \cdot 9 + 9 + 1$$
$$= 18 + 9 + 1$$
$$= \boxed{28}$$

5. $f(4b^2) + g(b)$ "f of $4b^2$ plus g of b"

$$f(4b^2) + g(b)$$
$$= 4(4b^2) - 7 + 2(b)^2 - 3(b) + 1$$
$$= 16b^2 - 7 + 2b^2 - 3b + 1$$
$$= \boxed{18b^2 - 3b - 6}$$

Operations with Functions

Operation	Definition	Examples if $f(x) = x + 2$, $g(x) = 3x$
Sum	$(f + g)(x) = f(x) + g(x)$	$(f + g)(x) = f(x) + g(x)$ $= x + 2 + 3x$ $= 4x + 2$ ✓
Difference	$(f - g)(x) = f(x) - g(x)$	$(f - g)(x) = f(x) - g(x)$ $= x + 2 - 3x$ $= -2x + 2$ ✓
Product	$(f \cdot g)(x) = f(x) \cdot g(x)$	$(f \cdot g)(x) = f(x) \cdot g(x)$ $= (x + 2)(3x)$ $= 3x^2 + 6x$ ✓

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

6. $(h + k)(x)$ "h plus k of x"
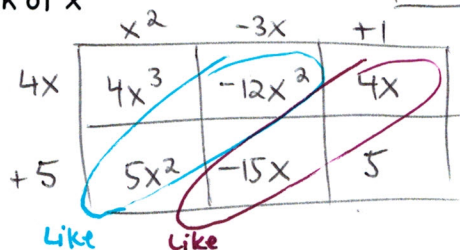
$= h(x) + k(x)$

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

$= \boxed{x^2 + x + 6}$

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

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

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

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

$= \boxed{-x^2 + 7x + 4}$

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

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

$= \boxed{4x^3 - 7x^2 - 11x + 5}$

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

Like   Like

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

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

$g(x) + f(x)$

$= 2x^2 - x - 1 + 3x^2 + 7x$

$= \boxed{5x^2 + 6x - 1}$

10. $(g - f)(x)$ Distribute "$-$"

$g(x) - f(x) = 2x^2 - x - 1 - (3x^2 + 7x)$

$= 2x^2 - x - 1 - 3x^2 - 7x$

$= \boxed{-x^2 - 8x - 1}$

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

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

$= \boxed{6x^4 + 11x^3 - 10x^2 - 7x}$

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

Like   Like

Done