Multiplying Polynomials (5.2) **Math 98**

Review

Definitions and Properties of Exponents

The following summary assumes that no denominators are 0 and that 0^0 is not considered. For any integers m and n,

1 as an exponent:	$a^1 = a$
0 as an exponent:	$a^0 = 1$
Negative exponents:	$a^{-n} = \dfrac{1}{a^n}$
	$\dfrac{a^{-n}}{b^{-m}} = \dfrac{b^m}{a^n}$
	$\left(\dfrac{a}{b}\right)^{-n} = \left(\dfrac{b}{a}\right)^n$
The Product Rule:	$a^m \cdot a^n = a^{m+n}$
The Quotient Rule:	$\dfrac{a^m}{a^n} = a^{m-n}$
The Power Rule:	$(a^m)^n = a^{mn}$
Raising a product to a power:	$(ab)^n = a^n b^n$
Raising a quotient to a power:	$\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$

Example 1: Multiply and simplify

a.) $\left(3x^3y^8\right)\left(-2x^4y^5\right)$

b.) $\left(-3a^2b^3c^4\right)\left(-7a^3b^7c^{11}\right)$

c.) $3x\left(4x-7\right)$

d.) $4rs^2\left(r^2-2s^2\right)$

Example 1 continued:

e.) $(x^2 - 5)(4x^2 + 3)$

f.) $(r + 3)(r^2 - 5r + 2)$

Example 2: Sometimes it can be easier to multiply vertically.

a.) $(3x^2 - 5x + 2)(2x^2 + x - 4)$

FOIL it before it foils you.

Example 3: Multiply

a.) $(x+4)(x-3)$

b.) $(3x-4y)(x-2y)$

c.) $(r-2)(r+3)(r-4)$

Question: Does $(x+4)^2 = x^2+16$? Discuss this with your neighbors and figure it out.

It's worth memorizing the square of a binomial (*perfect squares*)l:

- $(A+B)^2 = A^2 + 2AB + B^2$
- $(A-B)^2 = A^2 - 2AB + B^2$

The picture can help.

<u>Example 4</u>:

a.) $(x-3)^2$

b.) $(4x+3y)^2$

c.) $\left(5y^3 - \frac{1}{2}z\right)^2$

Explore the *difference of squares* to find the pattern:

a.) $(x-3)(x+3)$

b.) $(x+4)(x-4)$

The *difference of squares* formula:

Example 5: Multiply

a.) $(r-7)(r+7)$

b.) $(3xy+2z^2)(3xy-2z^2)$

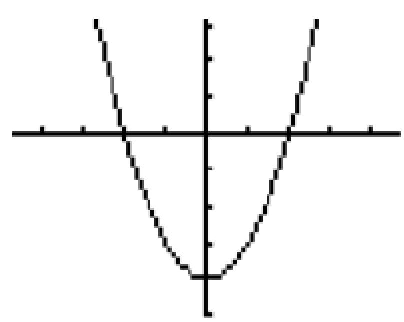
c.) $\left(\frac{2}{3}n-m^3\right)\left(\frac{2}{3}n+m^3\right)$

d.) $(3x+5y)(-3x+5y)$

Example 6: Multiply

a.) $(2t-3)^2-(t+2)(t-2)$

Connection with functions: The given graph shows $f(x)=(x-2)(x+2)=x^2-4$. Do you see any connections between the symbolic representation and the graph?



<u>Example 7</u>: Suppose $f(x) = x^2 - 3x + 2$. Find the following:

a.) $f(a)$

b.) $f(a) + 3$

c.) $f(a+3)$

d.) $f(a+h)$

e.) $f(a+h) - f(a)$