MATH 10

NOTES

MULTIPLYING A BINOMIAL BY A BINOMIAL

- **Apply the distributive law twice**
- **Collect like terms and simplify**
- When multiplying binomials of the same degree and of the same "type" the **<u>answer is a trinomial</u>** unless the two multiplied binomials are conjugates of each other

$$(2x+1)(3x-4) = (2x)(3x)+(2x)(-4)+(1)(3x)+(1)(-4)$$
$$= 6x^2 \underbrace{-8x+3x} -4 = \boxed{6x^2-5x-4}$$

Example1 :

$$(2a-b)(3a+4b) = (2a)(3a)+(2a)(4b)+(-b)(3a)+(-b)(4b)$$
$$= 6a^2+8ab-3ab-4b^2$$
$$= \underline{6a^2+5ab-4b^2}$$

Example 2: $(-x+13)(4x+2) = (-x)(4x)+(-x)(2)+(13)(4x)+(13)(2)$

$$= -4x^2-2x+52x+26$$
$$= \boxed{-4x^2+50x+26}$$

Note: Multiplying two conjugates gives a **difference of two perfect squares.**

Example:

$$(4x-3)(4x+3) = (4x)(4x)+(4x)(3)+(-3)(4x)+(-3)(3)$$
$$= 16x^2 \underbrace{+12x-12x}_{=0} -9$$
$$= \boxed{16x^2-9}$$

Multiplication of binomials of the same degree but of a different "type":

Example 1: $(2x^2 - x)(3x^2+1)$

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

$= 6x^4 + 2x^2 - 3x^3 - x$

$= \boxed{6x^4 - 3x^3 + 2x^2 - x}$ ← not a trinomial!

Example 2:

$(a+b^2)(a^2+b)$

$= a^3 + ab + a^2b^2 + b^3$

$= a^3 + a^2b^2 + ab + b^3$

Example 3: $(-2y^3+y)(3y^3+y^2)$

$= (-2y^3)(3y^3) + (-2y^3)(y^2) + (y)(3y^3) + (y)(y^2)$

$= \boxed{-6y^6 - 2y^5 + 3y^4 + y^3}$

Example 4: $(10x^2+y)(x-10y^2)$

$= (10x^2)(x) + (10x^2)(-10y^2) + (y)(x) + (y)(-10y^2)$

$= 10x^3 - 100x^2y^2 + xy - 10y^3$