FACTORING BINOMINALS

Greater Common Factor (GCF)

For example, consider the binomial $8x^2 + 12x$ = think of the factors of each term = 4*2*x∗x + 4∗3∗x

A. Look for a number and/or variable that are **common to both** terms.

1. Greatest common number is 4 (although "2" is also common to both terms, it is not the **greatest.)**

2. The common variable for both terms is "x" with the smallest exponent, in this case is x^1.

3. Finally, combining the common numbers with common variables, we get the GCF = 4x.

B. Divide each term by GCF.

$$\frac{8x^2}{4x} + \frac{12x}{4x} = 2x + 3$$

C. Rewrite the expression with GCF outside parentheses and the remainder after division inside. Note: the gcf is part of the factored form – don't drop it off

4x(2x+3)

D. Examples: $2x^3 + 36x^2 - 12x = 2x(x^2 + 18x - 6)$

$9yx^3 + 3yx + 6y^2x^2 = 3yx(3x^2 + 1 + 2yx)$

FACTORING BINOMIALS – SPECIAL CASES

A. Difference of Squares **$A^2 - B^2 = (A-B)(A+B)$**

First, **identify** that you have the **difference** of perfect squares!!!

EXAMPLES OF PERFECT SQUARES

NUMBERS	VARIABLES	COMBINATIONS
1	$a^2\ b^2\ x^2\ y^2$	$25x^2$
4	$a^4\ b^4\ x^4\ y^4$	$64b^4$
9	$a^6\ b^6\ x^6\ y^6$	$9a^6$
16	$a^8\ b^8\ x^8\ y^8$	$81y^8$
25	$a^{10}\ b^{10}\ x^{10}\ y^{10}$	$16x^{10}$

EXAMPLES OF BINOMIALS

1) $\overbrace{4x^2}^{perfectSquare} \underbrace{-}_{Difference} \overbrace{9y^6}^{PerfectSquare}$ OK

2) $\overbrace{x^2}^{perfectSquare} \underbrace{-}_{Difference} \overbrace{27}^{NotaPerfectSquare}$ NOT OK

3) $\overbrace{49x^2}^{perfectSquare} \underbrace{+}_{NOTaDifference} \overbrace{81y^6}^{PerfectSquare}$ NOT OK

4) $\overbrace{25x^4}^{PerfectSquare} \underbrace{-}_{Difference} \overbrace{81}^{PerfectSquare}$ OK

Example1: factor **$X^2 - 4$**.

1. Identify the perfect squares of both terms: in this case are **X^2** and **2^2**
2. Make sure that the expression is a difference (means minus (**–**) between the terms).
3. Take the $\sqrt{\ }$ of the first term and use that as the first term in each factor $\sqrt{x^2}$ **= X**.
4. Take the $\sqrt{\ }$ of the second term and use that as the second term in each factor $\sqrt{4}$ **= 2.**
5. Make the signs in each factor opposite **(+)(–).**
6. Use the results of the square roots is the factoring process:
   Ex: **$4x^2 - 9y^6 = (2x - 3y^3)(2x + 3y^3)$**
   $x^2 - 81 = (x+9)(x-9)$