

FACTORIZING HINTS

1. Always "take out" greatest common factors. (Remember: There may not always be a GCF)
ex. $2x^3 - 8x^2 + 6x$
 $2x(x^2 - 4x + 3)$ - this can be factored again to $2x(x-1)(x-3)$.
2. Count the number of terms

A. **Two terms**: Use formula if possible (think squares or cubes)

Difference of Squares

1) $x^2 - y^2 = (x - y)(x + y)$
ex. $4x^2 - 9 = (2x - 3)(2x + 3)$
 $(2x)^2 - (3)^2$

Sum of Square

2) $x^2 + y^2 = \text{Prime}$
ex. $4x^2 + 9$ (Cannot be factored; therefore, it is prime)

Difference of Cubes

3) $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$
ex. $8x^3 - 27y^3 = (2x - 3y)(4x^2 + 6xy + 9y^2)$

Sum of Cubes

4) $x^3 + y^3 = (x + y)(x^2 - xy + y^2)$
ex. $64x^3 + 1 = (4x + 1)(16x^2 - 4x + 1)$
 $(4x + 1)(16x^2 - 4x + 1)$

B. **Three terms**: You may use one of two different methods: Trial & Error or AC Method.

ex. **Trial & Error**

$$\begin{array}{l} 2x^3 - 8x^2 + 6x \\ 2x(x^2 - 4x + 3) \\ 2x(x - 1)(x - 3) \\ 2x(x - 3)(x - 1) \end{array} \quad \begin{array}{l} \text{-- step 1 above ("take out" common factors)} \\ \text{-- split up the } x^2 \\ \text{-- decide on the signs} \\ \text{-- split up the 3 (the last term) you must check with FOIL} \end{array}$$

For examples using the AC Method, please refer to our "Factoring Trinomials (AC Method)" handout.

C. **Four terms**: Grouping

ex. $5x^2 + 2x + 10x + 4$
 $(5x^2 + 2x) + (10x + 4)$ --divide into 2 groups
 $x(5x + 2) + 2(5x + 2)$ --factor each group separately (the inside of the parenthesis should be the same otherwise that will change the grouping)
 $x(5x + 2) + 2(5x + 2)$ --factor again
 $(5x + 2)(x + 2)$ -- factor out (5x+2)
 $(5x + 2)(x + 2)$ --check with FOIL

ex. $6x^2 + 3x - 8x - 4$
 $(6x^2 + 3x) - (8x + 4)$ -- a negative in the middle means change the 2nd sign.
 $3x(2x + 1) - 4(2x + 1)$ -- factor each group separately
 $(2x + 1)(3x - 4)$ -- factor out the (2x + 1)
Check with FOIL

The grouping can be changed and the results will stay the same.

$$\begin{array}{l} 6x^2 - 8x + 3x - 4 \\ 2x(3x - 4) + 1(3x - 4) \text{ --factor each group separately} \\ (3x - 4)(2x + 1) \text{ --factor out the } (2x + 1) \\ \text{Check with FOIL} \end{array}$$