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. \[64x^3 + 1 = (4x + 1)(16x^2 - 4x + 1)\]

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

   ex. Trial & Error
   \[2x^3 - 8x^2 + 6x\]
   \[= 2x(x^2 - 4x + 3)\] -- step 1 above ("take out" common factors)
   \[2x(x - \text{ } )\] -- split up the \(x^2\)
   \[2x(x - \text{ } )\] -- decide on the signs
   \[2x(x - 3)(x - 1)\] -- split up the 3 (the last term) you must check with FOIL

   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 2^nd 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.
   \[6x^2 - 8x + 3x - 4\]
   \[= 2x(3x - 4) + 1(3x - 4)\] -- factor each group separately
   \[= (3x - 4)(2x + 1)\] -- factor out the \((2x + 1)\)
   Check with FOIL