Rules for Factoring $(ax^2 + bx + c)$

1. Look for the Greatest Common Factor and factor it out first.

Example 1:

$3x^2 - 6x - 24 = 0$

$3(x^2 - 2x - 8) = 0$

$3(x - 4)(x + 2) = 0$

Example 2:

$3x + 12 = 0$

$3(x + 4) = 0$

2. Also look for a **Difference of Perfect Squares**.

$x^2 - 9 = 0$ $\qquad$ $(x + 3)(x - 3) = 0$

$4x^2 - 81 = 0$ $\qquad$ $(2x + 9)(2x - 9) = 0$

3. If the quadratic has no greatest common factor then follow the rules below:

Rules for Factoring a Trinomial when *a* = 1.

a) If the sign in front of c is **positive** then the signs in each parenthesis are the **same**. (If b is positive then they are both positive. If b is negative then they are both negative.)

Example 3:

$x^2 + 11x + 24 = 0$

$(x +\ \ )\ (x +\ \ ) = 0$

Example 4:

$x^2 - 5x + 6 = 0$

$(x -\ \ )\ (x -\ \ ) = 0$

b) If the sign in front of c is **negative** then the signs in the parenthesis are **different** signs. The middle sign designates how to assign positive or negative. If b is negative then the greater number gets the negative. If b is positive then the greater number gets the positive.

Example 5:

$x^2 - 7x - 18 = 0$

$(x + 2)(x - 9) = 0$

Example 6:

$x^2 + x - 6 = 0$

$(x + 3)(x - 2) = 0$

Rules for Factoring a Trinomial when *a* ≠ 1.

a) Take ***a*** and multiply by ***c***.

$ax^2 + bx + c$ $\qquad$ $x^2 + bx + ac$

$2x^2 + x - 6 = 0$ $\qquad$ $x^2 + x - 12 = 0$

b) Factor the new quadratic using the above rules.

$(x + a)(x + c)$ $\qquad$ $(x + 4)(x - 3) = 0$

c) Plug ***a*** back into **both** parentheses.

$(ax + a)(ax + c)$ $\qquad$ $(2x + 4)(2x - 3) = 0$

d) Divide out of **one** of the parenthesis (or a combination from both parentheses).

$\frac{(ax + a)}{a}\frac{(ax + c)}{1}$ $\qquad$ $\frac{(2x + 4)}{2}\frac{(2x - 3)}{1} = 0$

e) Then simplify.

$(x + 1)(ax + c)$ $\qquad$ $(x + 2)(2x - 3) = 0$

These are the factors!!!