Steps to Factor a Polynomial

Prep Arrange in descending order of powers and combine like terms.
ex) $10x - 3x^2 + 5x = -3x^2 + 15x$

I Factor Out the ***G**reatest **C**ommon **F**actor* (**GCF**),
Get a positive leading coefficient.
ex) $-3x^2 + 15x = -3x\,(x - 5)$

II If the Polynomial has **4 terms** or more,
Factor by **Grouping**
ex) $x^3 + x^2 \mid + 2x + 2$
$= x^2\,(x + 1) \mid + 2(x + 1)$
$= (x + 1)\,(x^2 + 2)$

III Factoring Trinomials **(3 terms)**

A. Trial and Error

1) Write down 2 pairs of parentheses
2) Determine your signs: **+ +**, **– –** or **+ –**
(*see bottom of page for more information*)
3) Factor the front term
4) Try different factors of the last term until binomials FOIL to the trinomial.

ex) $X^2 - x - 1$
( ) ( ) 12
(+) (–) $1 \cdot 12$
(x +) (–) $2 \cdot 6$
(x +) (x –) $3 \cdot 4$
$(x + 3)\,(x - 4)$

IV B. Perfect Square Trinomial
ex) $x^2 + 6x + 9$
$=(x + 3)\,(x + 3) = (x + 3)^2$

V Factoring Binomials (**2 terms**)

A. Difference of Two Squares
B. Sum of Two Squares – ***D**oes **N**ot **F**actor*
C. Difference of Two Cubes
D. Sum of Two Cubes

ex) $X^2 - 9 = (x + 3)\,(x - 3)$
ex) $X^2 + 25$ ***D**oes **N**ot **F**actor*
ex) $X^3 - y^3 = (x - y)\,(x^2 + xy + y^2)$
ex) $X^3 - y^3 = (x - y)\,(x^2 + xy + y^2)$

VI The Polynomial ***D**oes **N**ot **F**actor*
ex) $X^4 - 16 = (x^2 + 4)\,(x^2 - 4)$
$= (x^2 + 4)\,(x + 2)\,(x - 2)$
ex) $X^2 + 5x + 1$ ***D**oes **N**ot **F**actor*

Determine the signs of the factors + +, – –, or + –

$X^2 + 6x + 5 = (x + 1)\,(x + 5)$	SIGNS ARE THE SAME, SIGNS ARE BOTH +
$X^2 - 6x + 5 = (x - 1)\,(x - 5)$	SIGNS ARE THE SAME, SIGNS ARE BOTH –
$X^2 + 2x - 3 = (x + 3)\,(x - 1)$ $X^2 - 2x - 3 = (x + 1)\,(x - 3)$	SIGNS ARE OPPOSITES: + –