

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 Greatest Common Factor (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)	$\begin{aligned} & x^3 + x^2 \quad \quad + 2x + 2 \\ & = x^2(x + 1) \quad \quad + 2(x + 1) \\ & = (x + 1)(x^2 + 2) \end{aligned}$
III	Factoring Trinomials (3 terms)		
	A. Trial and Error	ex)	$\begin{array}{r} x^2 - x - 12 \\ (\quad) (\quad) \\ (+) (-) \\ (x +) (x -) \\ (x + 3) (x - 4) \end{array} \quad \begin{array}{r} 12 \\ 1 \cdot 12 \\ 2 \cdot 6 \\ \boxed{3 \cdot 4} \end{array}$
	1) Write down 2 pairs of parentheses		
	2) Determine your signs: ++, -- or +- ** See Below **		
	3) Factor the front term		
	4) Try different factors of the last term until the binomials FOIL to the trinomial.		
	B. Perfect Square Trinomial	ex)	$\begin{aligned} & x^2 + 6x + 9 \\ & = (x + 3)(x + 3) = (x + 3)^2 \end{aligned}$
IV	Factoring Binomials (2 terms)		
	A. Difference of Two Squares	ex)	$x^2 - 9 = (x + 3)(x - 3)$
	B. Sum of Two Squares - Does Not Factor	ex)	$x^2 + 25$ Does Not Factor
	C. Difference of Two Cubes	ex)	$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$
	D. Sum of Two Cubes	ex)	$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$
V	Check for Complete Factorization:	ex)	$\begin{aligned} x^4 - 16 &= (x^2 + 4)(x^2 - 4) \\ &= (x^2 + 4)(x + 2)(x - 2) \end{aligned}$
VI	The Polynomial Does Not Factor	ex)	$x^2 + 5x + 1$ Does Not Factor

Determine the signs of the factors: ++, -- or +-

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