

Factoring Toolbox

Factoring Polynomials with Four Terms

$(x+2)(x-5)$

GCF First

Factor out the GCF first, if there is one.

$$\begin{aligned} 6x^2 + 4x - 8x + 10 \\ = 2(3x^2 + 2x - 4x + 5) \end{aligned}$$

Factor by Grouping

$$\begin{aligned} 12x^2 + 8x - 21x - 14 \\ = (4x - 7)(3x + 2) \end{aligned}$$

Factoring Polynomials with Three Terms

$(x+2)(x-5)$

GCF First

Factor out the GCF first, if there is one.

$$6x^2 + 9x - 15 = 3(2x^2 + 3x - 5)$$

Coefficient of x^2 is 1

Trial and error or AC method.

$$x^2 + 7x + 12 = (x + 3)(x + 4)$$

Coefficient of x^2 is not 1

AC method or trial and error.

$$12x^2 + 8x - 15 = (2x + 3)(6x - 5)$$

Perfect Square Trinomial

Use the patterns

$$a^2 + 2ab + b^2 = (a + b)^2$$

$$a^2 - 2ab + b^2 = (a - b)^2$$

$$x^2 + 6x + 9 = (x + 3)^2$$

$$x^2 - 10x + 25 = (x - 5)^2$$

Quadratic Form

AC method $au^2 + bu + c$ where u is an expression

$$4x^4 - 11x^2 - 3$$

Let $u = x^2$

$$= 4u^2 - 11u - 3$$

$$= (4u + 1)(u - 3)$$

$$= (4x^2 + 1)(x^2 - 3)$$

Factoring Polynomials with Two Terms

$(x+2)(x-5)$

GCF First

Factor out the GCF first, if there is one.

$$6x^2 + 4x = 2x(3x + 2)$$

Difference of Squares

Use the difference of squares pattern.

$$a^2 - b^2 = (a + b)(a - b)$$

$$x^2 - 25 = (x + 5)(x - 5)$$

Sum of Cubes

Use the sum of cubes pattern.

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$x^3 + 8 = (x + 2)(x^2 - 2x + 4)$$

Difference of Cubes

Use the difference of cubes pattern.

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$x^3 - 27 = (x - 3)(x^2 + 3x + 9)$$