

1 Sum and difference of cubes

The sum or difference of two cubes can be factored into the product of a binomial (two terms) times a trinomial (three terms).

Difference of cubes:

$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

Sum of cubes:

$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

Examples:

1. Factorise $27x^3 - y^3$

Write as a difference of two cubes:

$$(3x)^3 - y^3$$

Then factorise:

$$(3x - y)((3x)^2 + 3xy + y^2) = (3x - y)(9x^2 + 3xy + y^2)$$

2. Factorise $40a^3 + 625b^3$

Factorise out a factor of 5 first:

$$5(8a^3 + 125b^3)$$

Write as a sum of cubes:

$$5((2a)^3 + (5b)^3)$$

Factorise:

$$5(2a + 5b)((2a)^2 - 2a \times 5b + (5b)^2) = 5(2a + 5b)(4a^2 - 10ab + 25b^2)$$