Sum and Difference of Two Cubes

Factoring the Difference of Two Cubes

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

1. Identify that we have a perfect cube minus another perfect cube.

2. Rewrite the problem as a first term cubed minus a second term cubed.
   (1st term)^3 − (2nd term) ^{3}

3. Factor the problem into the (first term minus the second term) times [the first term squared plus (the first term times the second term) plus the second term squared].

   (1st term − 2nd term) [(1st term)^2 + (1st term · 2nd term) + (2nd term)^2]

   $y^3 - 125 = (y)^3 - (5)^3$

   Substitute y for the "a".
   Substitute 5 for the "b".
   $(a-b)(a^2+ab+b^2)$
   $(y-5)(y^2+5y+5^2) = (y-5)(y^2+5y+25)$

Factoring the Sum of Two Cubes

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

1. Identify that we have a perfect cube plus another perfect cube.

2. Rewrite the problem as a first term cubed plus a second term cubed.
   (1st term)^3 + (2nd term) ^{3}

3. Factor the problem into the (first term plus the second term) times [the first term squared minus (the first term times the second term) plus the second term squared].

   (1st term + 2nd term) [(1st term)^2 − (1st term · 2nd term) + (2nd term)^2]

   $y^3 + 125 = (y)^3 + (5)^3$

   Substitute y for the "a".
   Substitute 5 for the "b".
   $(a+b)(a^2-ab+b^2)$
   $(y+5)(y^2-5y+5^2) = (y+5)(y^2-5y+25)$

Hint:

In the factorization of both the sum and the differences of two cubes, the sign in the binomial factor is **the same** as the sign of the second term of the binomial factor.

The sign of the middle term of the trinomial factor has the **opposite** sign of the second term of the binomial factor.

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

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

Cubed Forms

$x^{15} - 27$ Can be thought of as: $(x^5)^3 - (3)^3$ then apply the rule.

$$(x^5 - 3)(x^{10} + 3x^5 + 9)$$

TRY:

How can one think of $8x^6 - 1000y^{12}$

Careful – finding the cube of a coefficient is different than finding the cubed of a variable with exponent.