

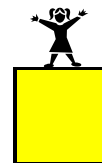
Factoring a Sum or Difference of Cubes

Difference of Squares

Recall that we have a convenient shortcut for factoring differences of squares...

Example

Factor the following.



- a) $x^2 - 25 = (x-5)(x+5)$
- b) $9x^2 - 16y^2 = (3x-4y)(3x+4y)$
- c) $x^4 - 81y^4 = (x^2 - 9y^2)(x^2 + 9y^2) = (x-3y)(x+3y)(x^2 + 9y^2)$

Investigating the Difference of Cubes

Factor the following:



- a) $x^3 - 8 = x^3 - 2^3 = (x-2)(x^2 + 2x + 4)$
- b) $x^3 - 27 = x^3 - 3^3 = (x-3)(x^2 + 3x + 9)$

- c) $27x^3 - 64 = (3x)^3 - 4^3 = (3x-4)(9x^2 + 12x + 16)$



$$\text{In general, } A^3 - B^3 = (A-B)(A^2 + AB + B^2)$$

Investigating the Sum of Cubes

Factor the following:

- a) $x^3 + 8 = x^3 + 2^3 = (x+2)(x^2 - 2x + 4)$
- b) $x^3 + 27 = x^3 + 3^3 = (x+3)(x^2 - 3x + 9)$

- c) $27x^3 + 64 = (3x)^3 + 4^3 = (3x+4)(9x^2 - 12x + 16)$



$$\text{In general, } A^3 + B^3 = (A+B)(A^2 - AB + B^2)$$

Notice that we don't really need a formula to factor a difference or sum of cubes!

Practice

Factor the following:

- a) $8x^3 + 125 = (2x)^3 + 5^3 = (2x+5)(4x^2 - 10x + 25)$
- b) $7x^4 - 448x = 7x(x^3 - 64) = 7x(x^3 - 4^3) = 7x(x-4)(x^2 + 4x + 16)$

- c) $x^9 - 512 = (x^3)^3 - 8^3 = (x^3 - 8)(x^6 + 8x^3 + 64) = (x^3 - 2^3)(x^6 + 8x^3 + 64) = (x-2)(x^2 + 2x + 4)(x^6 + 8x^3 + 64)$