

6.6: Sum and Difference of Cubes

Note Title

10/27/2016

Sum and Difference of two cubes factorization

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

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

*

Mnemonic Devices (for remembering the signs) Memorize this!

M match

O opposite

P plus

OR

S Same

O Opposite

A Always

P Positive

Perfect cubes:

$$1^3 = 1$$

$$2^3 = 8$$

$$3^3 = 27$$

$$4^3 = 64$$

$$5^3 = 125$$

$$6^3 = 216$$

$$7^3 = 343$$

$$8^3 = 512$$

$$9^3 = 729$$

$$10^3 = 1000$$

Ex:

Factor:

$$y^3 - 27$$

$$y^3 - 3^3$$

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

$$(y - 3)(y^2 + 3y + 9)$$

Check:

$$y^3 + 3y^2 + 9y - 3y^2 - 9y - 27$$

$$= y^3 - 27 \checkmark$$

Ex. Factor

$$x^3 + 8$$

$$x^3 + 2^3$$

$$(x + 2)(x^2 - 2x + 2^2)$$

$$(x + 2)(x^2 - 2x + 4)$$

Ex. $8w^3 + 125$

$$(2w)^3 + (5)^3$$

$$(2w + 5)((2w)^2 - 2w(5) + 5^2)$$

$$(2w + 5)(4w^2 - 10w + 25)$$

Check

$$8w^3 - 20w^2 + 50w + 20w^2 - 50w + 125$$

$$= 8w^3 + 125 \checkmark$$

Common mistake:
 $(2w + 5)(2w^2 - 10w + 25)$
wrong!
must square the 2 as well as the w

Ex. Factor

$$2x^4 + 5x^3 - 2x - 5$$

$$(2x^4 + 5x^3) + (-2x - 5)$$

$$x^3(2x + 5) - 1(2x + 5)$$

$$(2x + 5)(x^3 - 1)$$

$$(2x + 5)(x^3 - 1^3)$$

$$(2x + 5)(x - 1)(x^2 + 1x + 1^2)$$

$$(2x + 5)(x - 1)(x^2 + x + 1)$$