

C12 - 1.3 - Difference/Sum of Cubes/Squares Notes

Examples

Difference of Squares $a^2 - b^2 = (a - b)(a + b)$ $x^2 - 4 = (x - 2)(x + 2)$

Difference of Cubes $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ $x^3 - 27 = (x - 3)(x^2 + 3x + 3^2)$

Sum of Cubes $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ $x^3 + 1 = (x + 1)(x^2 - 1x + 1^2)$

SOAP - Same sign, Opposite sign, Always Plus Check by Long/Synthetic Division/FOIL

$4x^2 - 49$
 $(2x)^2 - 7^2$
 $(2x + 7)(2x - 7)$

Change of base
 (What is being Squared)
 $(x + 1)^2 - 16$
 $((x + 1) + 4)((x + 1) - 4)$ **OR**
 $(x + 5)(x - 3)$

$(x + 1)^2 - 16$
 $x^2 + 2x + 1 - 16$
 $x^2 + 2x - 15$
 $(x + 5)(x - 3)$

$(x + 2)^4 - 16$
 $((x + 2)^2)^2 - 4^2$
 $((x + 2)^2 + 4)((x + 2)^2 - 4)$
 $(x^2 + 4x + 4 + 4)(x^2 + 4x + 4 - 4)$
 $(x^2 + 4x + 8)(x^2 + 4x)$
 $x(x^2 + 4x + 8)(x + 4)$

$x^3 - 8 = (x - 2)(x^2 + 2x + 2^2)$	2	1	0	0	-8	List Factors	$(x - 2)(x^2 + 2x + 4)$	
± 2	$f(2) = 0$	+	2	4	8	Inspection	$x^3 + 2x^2 + 4x - 2x^2 - 4x - 8$	
$(x - 2)$ Is a factor			1	2	4	0	Synthetic	$x^3 - 8$
							Check by FOIL	

$8x^3 - 1$ $(2x)^3 - (1)^3$ $(2x - 1)((2x)^2 + (2x)(1) + (1)^2)$ $(2x - 1)(4x^2 + 2x + 1)$

Change of Base
 (What is being Cubed)
 Formula/Simplify

$27x^3 + 8$ $(3x)^3 + (2)^3$ $(3x + 2)((3x)^2 - (3x)(2) + (2)^2)$ $(3x + 2)(9x^2 - 6x + 4)$

$(\text{First Thing})^3 \pm (\text{Second Thing})^3 = (a)^3 - (b)^3$
 (First Thing ___ Second Thing)(First Thing Squared ___ First Thing \times Second Thing ___ Second Thing Squared)

$(x + 1)^3 - 27$
 $(x + 1)^3 - 3^3$
 $((x + 1) - (3))((x + 1)^2 + 3(x + 1) + (3)^2)$
 $(x - 2)(x^2 + 2x + 1 + 3x + 3 + 9)$
 $(x - 2)(x^2 + 5x + 13)$

OR
 $27 - (x + 1)^3$
 $(3 - (x + 1))(3^2 - 3(x + 1) + (x + 1)^2)$

FOIL/Binomial Expansion
 $(x + 1)^3 =$
 $(x + 1)(x + 1)(x + 1)$
 $(x^2 + 2x + 1)(x + 1)$
 $x^3 + 3x^2 + 3x + 1 \dots$