Difference of Squares Factoring | MPM2D

Motivation: Expand the following binomial products...

a) $(x-4)(x+4)$

$= x^2 + 4x - 4x - 16$

$= x^2 - 16$

b) $(x+6)(x-6)$

$= x^2 - 6x + 6x - 36$

$= x^2 - 36$

c) $(2x-3)(2x+3)$

$= 4x^2 + 6x - 6x - 9$

$= 4x^2 - 9$

d) $(3x-2y)(3x+2y)$

$= 9x^2 - 4y^2$

e) $(4a^2-3b^2)(4a^2+3b^2)$

$= 16a^4 - 9b^4$

Recall that multiplying a binomial by its conjugate produced a **difference of squares:**

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

KEY IDEA: We can work in reverse to factor a difference of squares $a^2 - b^2$ into $(a+b)(a-b)$.

Example: Verify that each of the following are **difference of squares** expressions. Then, factor them.

a) $x^2 - 144$

$= (x+12)(x-12)$

$\sqrt{x^2} = x$

$\sqrt{144} = 12$

b) $25x^2 - 4$

$= (5x+2)(5x-2)$

$\sqrt{25x^2} = 5x$

$\sqrt{4} = 2$

c) $25x^2 - 36$

$(5x+6)(5x-6)$

d) $x^4 - 9$

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

$\sqrt{x^4} = x^2$

$\sqrt{9} = 3$

e) $9a^2b^2 - 4c^2$

$= (3ab+2c)(3ab-2c)$

$\sqrt{9a^2b^2} = 3ab$

$\sqrt{4c^2} = 2c$

f) $a^4b^6 - 49c^8$

$= (a^2b^3 + 7c^4)(a^2b^3 - 7c^4)$

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Don't think of this as one more method of factoring to memorize, think of it as a shortcut to help make your factoring even easier.

Remember that you should always check to common factor first.

Example: Common factor the following expressions, and then apply difference of squares factoring.

a) $5x^2 - 20$

$= 5(x^2 - 4)$

$= 5(x+2)(x-2)$

b) $7x^2 - 63$

$= 7(x^2 - 9)$

$= 7(x+3)(x-3)$

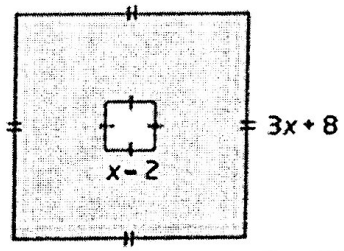
c) $25x^2y^2 - 100$

$= 25(x^2y^2 - 4)$

$= 25(xy + 2)(xy - 2)$

Example: Modelling an area

a) Determine an expression for the shaded area diagrammed at the right.



$A = (3x+8)^2 - (x-2)^2$

b) Factor this expression as a difference of squares

$= (3x + 8 + (x-2))(3x + 8 - (x-2))$

$= (3x + 8 + x - 2)(3x + 8 - x + 2)$

$= (4x + 6)(2x + 10)$

$= 2(2x+3)2(x+5)$ → $= 4(2x+3)(x+5)$

Now it is time to practice:

- Head to page 253 in your text, copy down the first two key concepts. The third we will look at tomorrow.
- 1, 2, 5ad, 6dfi, 7, 9, 10bc