SKILL #18

CODE: DS.1

Difference of squares

Core Concept

A difference of squares is when you subtract two perfect squares $(a^2 - b^2)$. It always factors into two binomials: one with a sum and one with a difference:

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

When to use it?

- When you see two terms separated by a minus sign.
- Both terms must be perfect squares

GULDEN RULE

If a polynomial is in the form $a^2 - b^2$, it factors as $(a - b)(a + b)$, where a and b are the square roots of the two terms.

$a^2 + b^2$ cannot be factored (called a "prime" polynomial).

Recognizing Perfect Squares

- Perfect squares of numbers: $1, 4, 9, 16, 25, 36, 49, 64$ . ..
- Perfect squares of variables: x^2, x^4, x^6, x^8... (even powers)
- Perfect squares of terms: $(2x)^2 = 4x^2, (5ab)^2 = 25a^2b^2$

Examples

Example 1: Factor $x^2 - 49$

STEP 1: Identify squares x^2 and $49 = 7^2$

NOTE: We need the roots $(x \; and \; 7)$

STEP 2: Apply formula

$$x^2 - 7^2 = (x + 7)(x - 7)$$ ✅

Common mistakes:

$$x^2 - 49 = (x + 49)(x - 49)$$ ❌

Example 2: With Coefficients

Factor $9y^2 - 64$.

STEP 1: Identify squares

$9y^2 = (3y)^2$ and $64 = 8^2$

NOTE: The roots are $3y$ and 8

STEP 2: Apply formula

$$(3y)^2 - 8^2 = (3y + 8)(3y - 8)$$ ✅

Example 3: GCF First

Factor $18x^2 - 50$

STEP 1: Factor out 2: $2(9x^2 - 25)$

STEP 2: Factor $(9x^2 - 25)$

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

STEP 3: Combine all factors:

$2(9x^2 - 25) = 2(3x + 5)(3x - 5)$ ✅

⚠ Common Mistakes to Avoid

- ❌ Trying to factor $a^2 + b^2$.
- ❌ Forgetting to check if terms are perfect squares.
- ❌ Wrong sign in the factors: Remember it's $(a + b)(a - b), not \; (a - b)(a - b)$.

Quick Tips

- Memorize common perfect squares.
- If you see even exponents on variables, they're likely perfect squares

Additional Resources

By: SALAH ALKMALI