SKILL #22

CODE: SQ.1

Solving Equations by Factoring

Core Concept

Factoring helps us break down equations into simpler parts. When we solve equations by factoring, we are finding the values of the variable(s) that make the equation true.

You use factoring when you have a polynomial equation (quadratic equation, cubic equation, etc.).

GULDEN RULE

Zero Product Property

- If $A \times B = 0$, then either $A = 0$ or $B = 0$ (or both!).

We use this property by:

- Getting the equation equal to zero.
- Factoring the polynomial on one side.
- Setting each factor equal to zero and solving for the variable.

Examples

MORE EXAMPLES

Example 1 – Simple Quadratic: Solve: $x^2 - 5x = 0$

Step 1: Already has zero on one side. ✅

Step 2: Factor $\rightarrow x(x-5) = 0$

Step 3: Set factors to zero:

$x = 0$ or $x - 5 = 0 \rightarrow x = 5$

Check: $0^2 - 5(0) = 0$ ✅ $5^2 - 5(5) = 25 - 25 = 0$ ✅

Example 2: Trinomial: Solve: $x^2 + 7x + 12 = 0$

Step 1: Already has zero on one side. ✅

Step 2: Factor $\rightarrow (x+3)(x+4) = 0$

Step 3: Set factors to zero:

$x + 3 = 0 \rightarrow x = -3$ *or* $x + 4 = 0 \rightarrow x = -4$

Check: $(-3)^2 + 7(-3) + 12 = 9 - 21 + 12 = -12 + 12 = 0$ ✅

$(-4)^2 + 7(-4) + 12 = 16 - 28 + 12 = -12 + 12 = 0$ ✅

Example 3 – Difference of Squares: Solve: $x^2 - 25 = 0$

Step 1: Already has zero on one side. ✅

Step 2: Factor $\rightarrow (x+5)(x-5) = 0$

Step 3: Set factors to zero:

$x + 5 = 0 \rightarrow x = -5$ or $x - 5 = 0 \rightarrow x = 5$

Check: $(-5)^2 - 25 = 25 - 25 = 0$ ✓

$5^2 - 5(5) = 25 - 25 = 0$ ✅

Example 4 – Perfect square polynomial: Solve: $x^2 - 8x + 16 = 0$

Step 1: Already has zero on one side. ✅

Step 2: Factor $\rightarrow (x-4)^2 = 0$

Step 3: Set factors to zero:

$x - 4 = 0 \rightarrow x = 4$

Check: $4^2 - 8(4) + 16 = 16 - 32 + 16 = -16 + 16 = 0$ ✅

⚠ Common Mistakes to Avoid

- ❌ Forget to move everything to one side first
- ❌ Factor incorrectly and miss solutions
- ❌ Forget that both factors could equal zero
- ❌ Stop after factoring - you must solve each factor!

Additional Resources

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