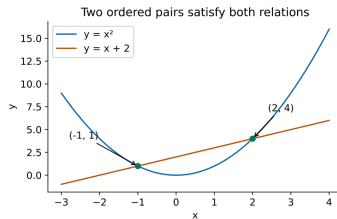


Nonlinear equations and mixed systems

Original skill preparation; versioned source scope

Method and conditions



- A candidate root must satisfy the original equation.
- Factorisation; substitution; domain restrictions.

Worked method 1

Read and reason

A candidate root must satisfy the original equation. In $\sqrt{x+6} = x$, the right side must be nonnegative. Squaring gives $x^2 - x - 6 = 0$, so candidates are 3, -2. Only 3 survives the original check: $\sqrt{9} = 3$.

Original context 1

Read and reason

Task context

Read and reason

Each task below states its own complete data. Values may differ from the worked example.

Attempt 1.1

Read and reason

Solve $\sqrt{2x+3} = x$ over the real numbers, showing why any candidate is rejected.

Reasoning 1.1

Read and reason

Require $x \geq 0$. Squaring yields $x^2 - 2x - 3 = (x - 3)(x + 1) = 0$. Candidates are 3 and -1. The original gives $\sqrt{9} = 3$ at 3, but $\sqrt{1} = 1 \neq -1$ at -1. Only $x = 3$ works.

Attempt 2.1

Read and reason

Solve simultaneously $y = x + 2$ and $y = (x - 1)^2$. Give exact ordered pairs and verify the number of intersections.

Reasoning 2.1

Read and reason

Equate outputs to get $x + 2 = x^2 - 2x + 1$, or $x^2 - 3x - 1 = 0$. Thus $x = (3 \pm \sqrt{13})/2$ and $y = (7 \pm \sqrt{13})/2$ with matching signs. The discriminant 13 is positive, so there are two distinct real intersections; both expressions for y agree by the derived equation.

Attempt 3.1

Read and reason

Solve $|3x + 2| = 7$ and $(x^2 - 9)/(x - 3) = 6$. Explain why these equations have different solution counts.

Reasoning 3.1

Read and reason

The absolute value gives $3x + 2 = 7$ or -7 , hence $x = 5/3$ or -3 . The rational equation requires $x \neq 3$ and simplifies to $x + 3 = 6$, whose sole candidate 3 is excluded. It has no solution.

Transfer and limits

Read and reason

Factorisation; substitution; domain restrictions.

Check yourself

Read and reason

Close the worked reasoning. Explain why the method fits the final transfer task, reconstruct its conclusion, and state a condition that would change your answer. Then check the full reasoning in the reference.