

Learning Tip:

# How to Detect Mathematical Errors

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# How to Detect Mathematical Errors

It can be hard to spot potential mistakes in a purported solution to a math problem!

- ▶ **Confirmation bias for your own solutions:** Once you've invested effort, you unconsciously favour steps that support your result and overlook contradictions or alternative cases.
- ▶ **Authority bias for others' solutions:** We tend to trust published (e.g., in a textbook, by your instructor) or computer-generated solutions (e.g., by a CAS or GenAI) and may skip vetting them.

What are some tools that can help us overcome these biases?

# How to Detect Mathematical Errors

- 1. Use Units and Dimensions:** Ensure units or dimensions balance (where applicable).
- 2. Boundary & Special Cases:** Test at extremes and simple cases (e.g., 0, 1,  $\infty$ , symmetric or degenerate inputs).
- 3. Sign and Magnitude Check:** Did you expect a positive or negative answer? Is the answer's order-of-magnitude reasonable?
- 4. Plug Back In:** Substitute your solution into the original equation/problem to verify it.
- 5. Alternative Solution Check:** Can you solve the problem using a different approach? Does that get you the same answer?
- 6. Peer-Explain Test:** Explain the solution to a peer (even an imaginary one); gaps you can't explain can indicate errors.

These tools not only help you catch subtle mistakes, but also train you to reason more rigorously and improve your overall mathematical judgment!