Spotting Inconsistent Systems by Graphing Parallel Lines

Original tasks 1, 2, 3 / complete keys

Task 1

Graph y = x + 1 and y = x - 2 on the same grid. State whether the system is inconsistent and explain why.

Answer: The system is inconsistent because both lines have slope 1 but y-intercepts 1 and -2, so the lines are parallel and never intersect.

Reason: Plot (0, 1) and (1, 2) for the first line; plot (0, -2) and (1, -1) for the second. The vertical gap is 1 - (-2) = 3 at x = 0 and 2 - (-1) = 3 at x = 1. A constant gap confirms parallel distinct lines.

Check: Set x + 1 = x - 2. Subtracting x gives 1 = -2, which is false, so no solution exists.

Task 2

Graph y = -2x + 3 and y = -2x - 1 on the same grid. State whether the system is inconsistent and explain why.

Answer: The system is inconsistent because both lines have slope -2 but y-intercepts 3 and -1, so the lines are parallel and never intersect.

Reason: Plot (0, 3) and (1, 1) for the first line; plot (0, -1) and (1, -3) for the second. The vertical gap is 3 - (-1) = 4 at x = 0 and 1 - (-3) = 4 at x = 1. A constant gap confirms parallel distinct lines.

Check: Set -2x + 3 = -2x - 1. Adding 2x to both sides gives 3 = -1, which is false, so no solution exists.

Task 3

Graph y = 0.5x + 4 and y = 0.5x - 1. Measure the vertical gap at x = 0 and x = 2. Is the system inconsistent?

Answer: Yes, the system is inconsistent. The slopes are both 0.5, and the y-intercepts are 4 and -1. The vertical gap is 5 at x = 0 and 5 at x = 2, confirming parallel distinct lines with no intersection.

Reason: At x = 0, y-values are 4 and -1, gap 5. At x = 2, y-values are 5 and 0, gap 5. The constant gap shows the lines never meet.

Check: Set 0.5x + 4 = 0.5x - 1. Subtracting 0.5x gives 4 = -1, which is false, so no solution exists.

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Original tasks 4 / complete keys

Task 4

A student graphs y = 4x - 2 and y = 4x + 5 and writes 'the lines are parallel, so there is one solution.' Identify the error and give the correct conclusion.

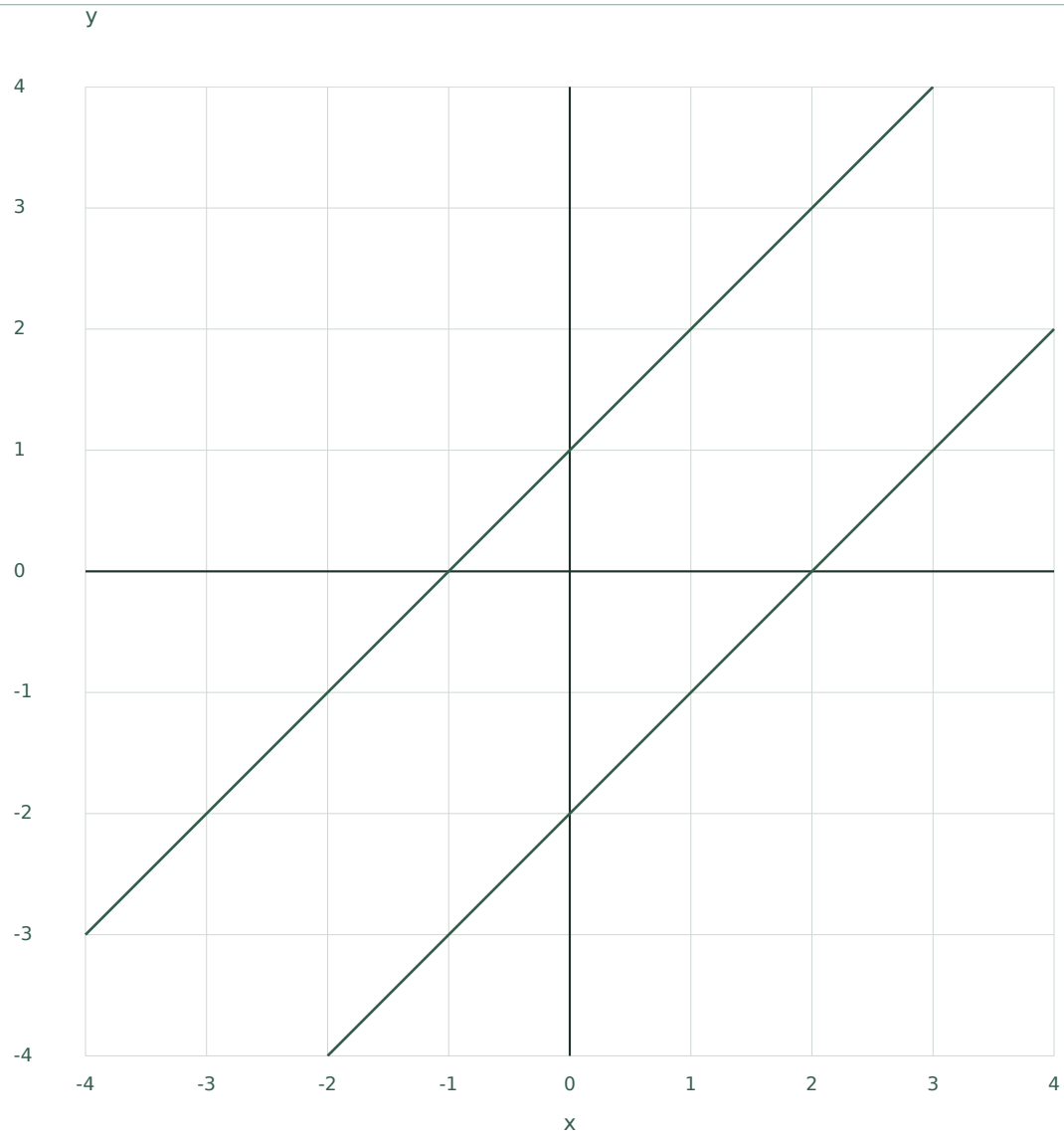
Answer: The error is claiming one solution for parallel distinct lines. The correct conclusion is that the system is inconsistent and has no solution because the slopes are equal (4) and the intercepts differ (-2 and 5).

Reason: Parallel distinct lines never intersect, so no ordered pair satisfies both equations. One solution would require different slopes so the lines cross once.

Check: Set 4x - 2 = 4x + 5. Subtracting 4x gives -2 = 5, which is false, confirming no solution.

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Answer graph: y = x + 1 and y = x - 2



Parallel lines with constant vertical gap 3.

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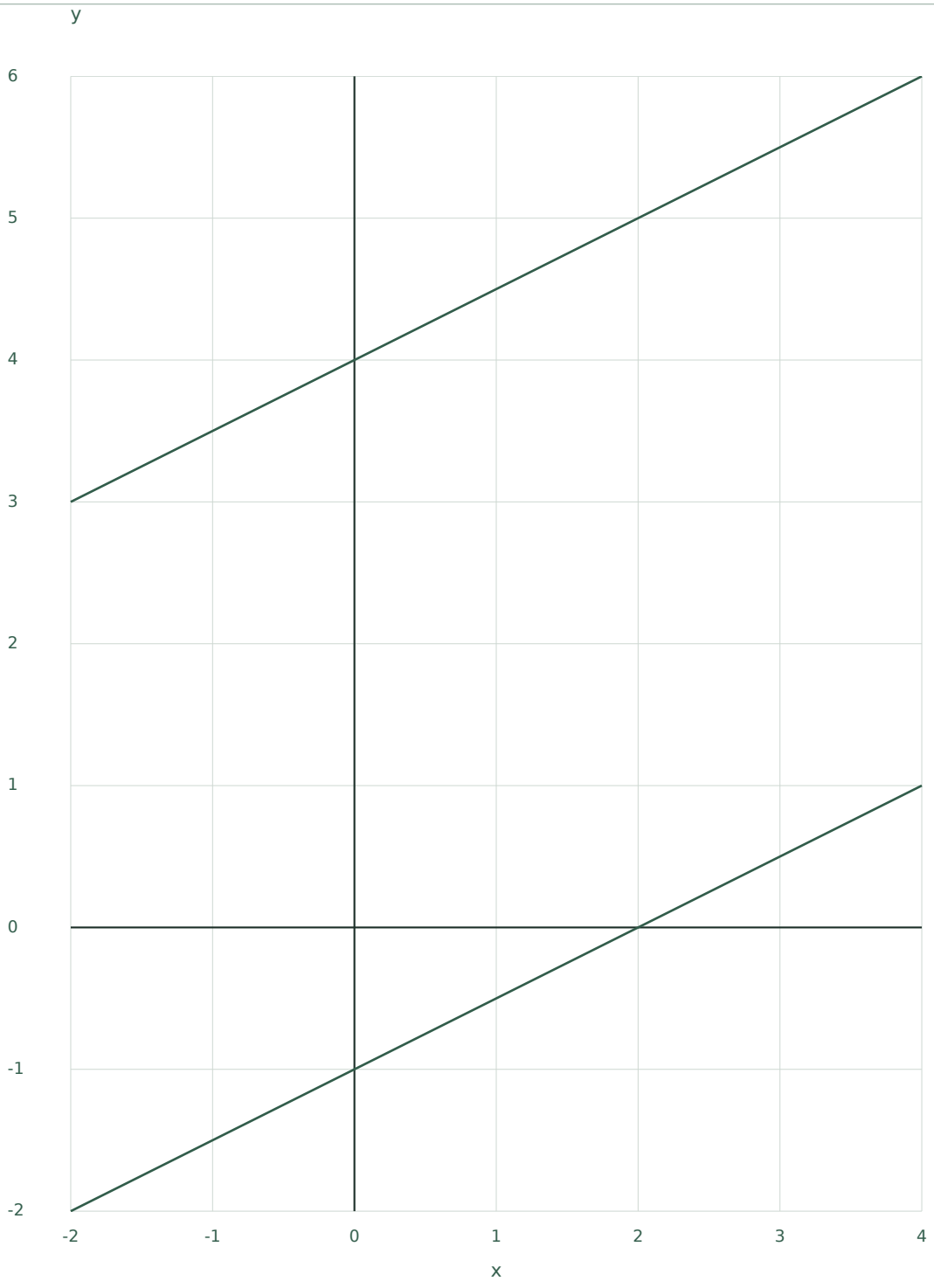
Answer graph: y = -2x + 3 and y = -2x - 1



Parallel lines with constant vertical gap 4.

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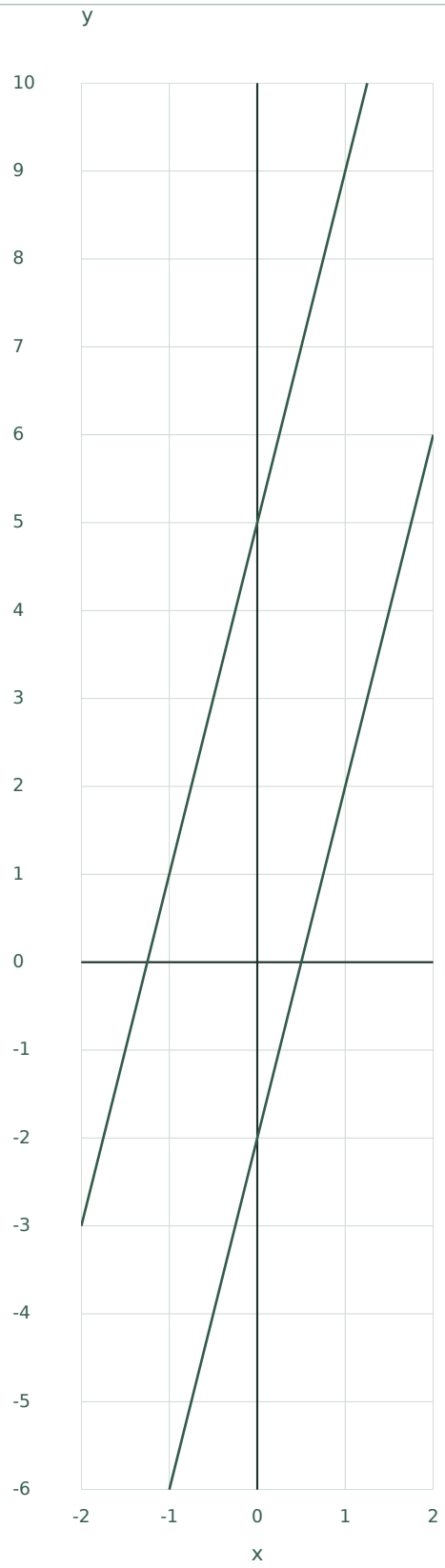
Answer graph: y = 0.5x + 4 and y = 0.5x - 1



Parallel lines with constant vertical gap 5.

Spotting Inconsistent Systems by Graphing Parallel Lines

Answer graph: y = 4x - 2 and y = 4x + 5



Parallel lines with constant vertical gap 7.

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Source rubric / reflection

- [ ] Identifies the slope of each equation correctly.
- [ ] Identifies the y-intercept of each equation correctly.
- [ ] States that equal slopes with different intercepts produce parallel distinct lines.
- [ ] Concludes that the system is inconsistent and has no solution.
- [ ] Supports the conclusion with a graph or a numerical gap check.
- [ ] Avoids confusing parallel distinct lines with coincident lines.

Reflection: What did you check, what did you change, and what will you try next?