

Mathverse

Contribution 2 — Chain of Thought Evaluation strategy



Question:

The x-intercept of the line is -3 and the y-intercept is -6. State the inequality that describes the region drawn in the plane.

Answer: $y \geq -2x - 6$.

Subject: 🚩 Expression

Version: Text Dominant

Model Output

The line passes through the points (-3, 0) and (0, -6). We can use these points to find the equation of the line. Let's use the slope-intercept form of a linear equation: $y = mx + b$, where m is the slope and b is the y-intercept. First, we'll find the slope (m) ...

Key-step Extraction

1. Use the slope-intercept form of a linear equation: $y = mx + b$.
2. Find the slope (m) using the formula: $m = (y_2 - y_1) / (x_2 - x_1)$. Using the points (-3, 0) and (0, -6): $m = (-6 - 0) / (0 - (-3))$, $m = -2$.
3. Find the y-intercept (b) using one of the points and the slope-intercept form of the equation: $0 = -2 * (-3) + b$, $b = -6$.
4. Since the line is solid, the inequality is either $y \leq -2x - 6$ or $y \geq -2x - 6$.
5. The region below the line is shaded, which means the values of y should be less than or equal to $-2x - 6$.
6. The inequality describing the region drawn in the plane is: $y \leq -2x - 6$.

Multi-step Scoring

- | | |
|---|-------|
| 1. The model correctly states that the slope-intercept form of a linear equation is $y = mx + b$. | ✓ 1/1 |
| 2. The model correctly calculates the slope (m) using the given points (-3, 0) and (0, -6). | ✓ 1/1 |
| 3. The model correctly finds the y-intercept (b) using one of the points and the slope-intercept form of the equation. | ✓ 1/1 |
| 4. The equation of the line is correctly stated as $y = -2x - 6$. | ✓ 1/1 |
| 5. The model incorrectly states that the region below the line is shaded. However, based on the diagram and the ground truth answer, the region above the line is shaded. | ✗ 0/1 |
| 6. The final inequality provided by the model is $y \leq -2x - 6$, which does not match the ground truth answer of $y \geq -2x - 6$. | ✗ 0/1 |

Multi-step Score: $(1 + 1 + 1 + 1 + 0 + 0) / 6 = 2/3 \approx 0.67$

Final CoT Evaluation Score: $0.67 \times 0.7 + 0 \times 0.3 = 0.47$

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Result

- MLLMs struggle to understand math diagrams.
- MLLMs relying heavily on textual information.

