Writing Systems of Inequalities from Shaded Graphs: Reverse Reasoning Practice

Original tasks 1, 2, 3 / complete keys

Task 1

A graph shows a solid line through (0,2) and (3,5). The shaded region is above this line. A second solid line passes through (0,6) and (3,0), and the shaded region is below this line. Write the system.

Answer: $y \geq x + 2$ and $y \leq -2x + 6$

Reason: First line slope (5-2)/(3-0)=1, intercept 2, solid above gives $y \geq x+2$. Test (0,3): $3 \geq 2$ true. Second line slope (0-6)/(3-0)=-2, intercept 6, solid below gives $y \leq -2x+6$. Test (0,3): $3 \leq 6$ true. System: $y \geq x+2$ and $y \leq -2x+6$.

Check: Test (1,4): $4 \geq 3$ true and $4 \leq 4$ true, so inside. Test (0,0): $0 \geq 2$ false, so outside fails first inequality.

Task 2

A graph shows a dashed line through (0,1) and (2,3). The shaded region is below this line. A solid vertical line is at $x = 1$, and the shaded region is to the right. Write the system.

Answer: $y < x + 1$ and $x \geq 1$

Reason: Slanted line slope (3-1)/(2-0)=1, intercept 1, dashed below gives $y < x+1$. Test (2,0): $0 < 3$ true. Vertical line solid at $x=1$, shaded right gives $x \geq 1$. Test (2,0): $2 \geq 1$ true. System: $y < x+1$ and $x \geq 1$.

Check: Test (2,1): $1 < 3$ true and $2 \geq 1$ true, so inside. Test (0,0): $0 < 1$ true but $0 \geq 1$ false, so outside fails second inequality.

Task 3

A graph shows a solid line through (0,5) and (5,0). The shaded region is below this line. A dashed line passes through (0,0) and (2,4), and the shaded region is above this line. Write the system.

Answer: $y \leq -x + 5$ and $y > 2x$

Reason: First line slope (0-5)/(5-0)=-1, intercept 5, solid below gives $y \leq -x+5$. Test (1,1): $1 \leq 4$ is true, confirming the shaded side is below this boundary. Second line slope (4-0)/(2-0)=2, intercept 0, dashed above gives $y > 2x$. Test (1,3): $3 > 2(1)$ is true, confirming the shaded side is above this boundary. Test an outside point below the line, such as (1,0): $0 > 2$ is false. System: $y \leq -x+5$ and $y > 2x$.

Check: Test (1,3): $3 \leq 4$ true and $3 > 2$ true, so inside. Test (1,0): $0 \leq 4$ true but $0 > 2$ false, so outside fails the second inequality.

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Original tasks 4 / complete keys

Task 4

A graph shows a dashed horizontal line at y = 2 with shading above it. A solid line passes through (0,0) and (2,2), and the shaded region is below this line. Write the system.

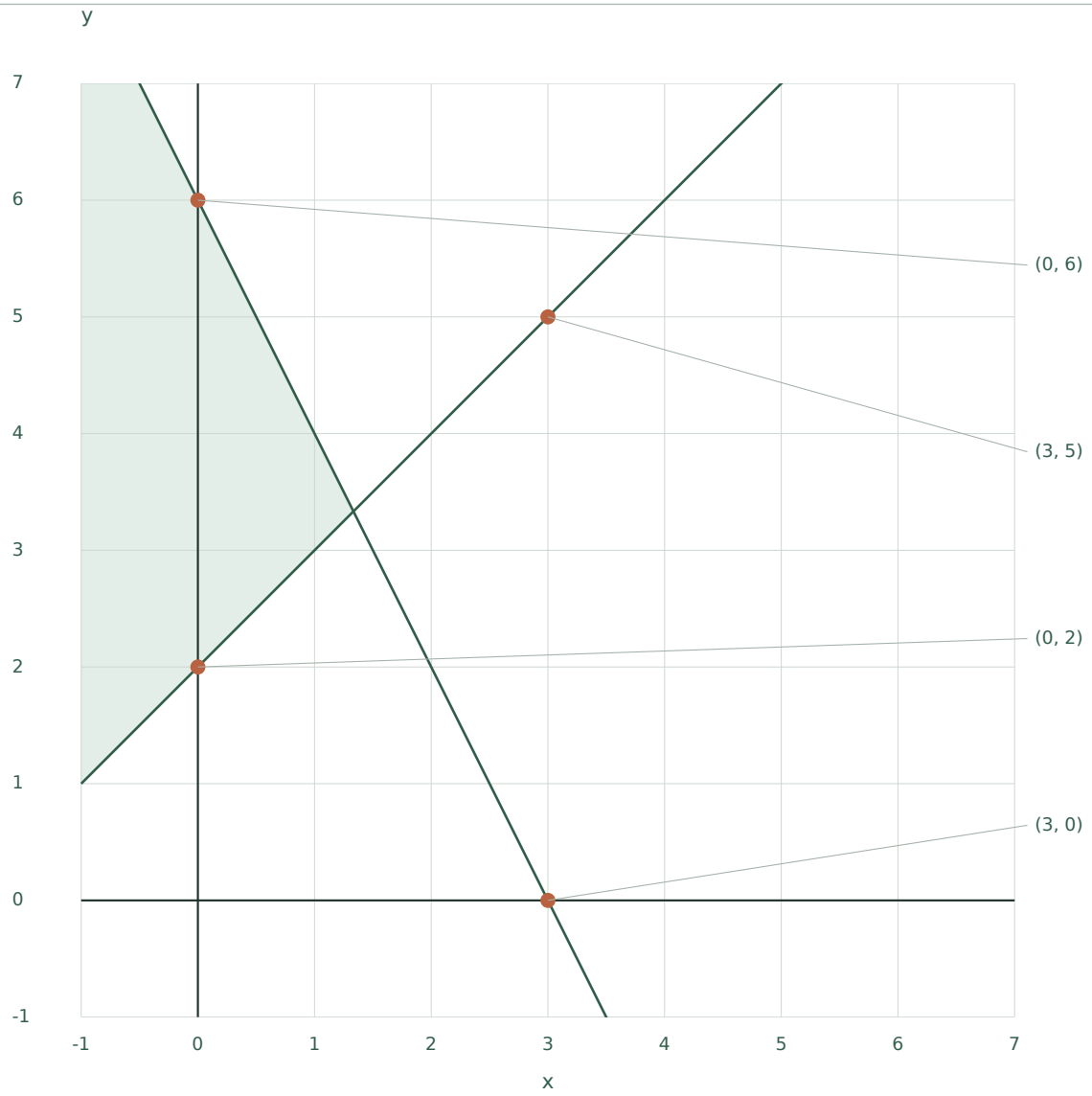
Answer: $y > 2$ and $y \leq x$

Reason: Horizontal dashed line at y=2, shaded above gives $y > 2$. Test (3,3): $3 > 2$ true. Slanted solid line slope (2-0)/(2-0)=1, intercept 0, shaded below gives $y \leq x$. Test (3,3): $3 \leq 3$ true. System: $y > 2$ and $y \leq x$.

Check: Test (3,3): $3 > 2$ true and $3 \leq 3$ true, so inside. Test (1,1): $1 > 2$ false, so outside fails first inequality.

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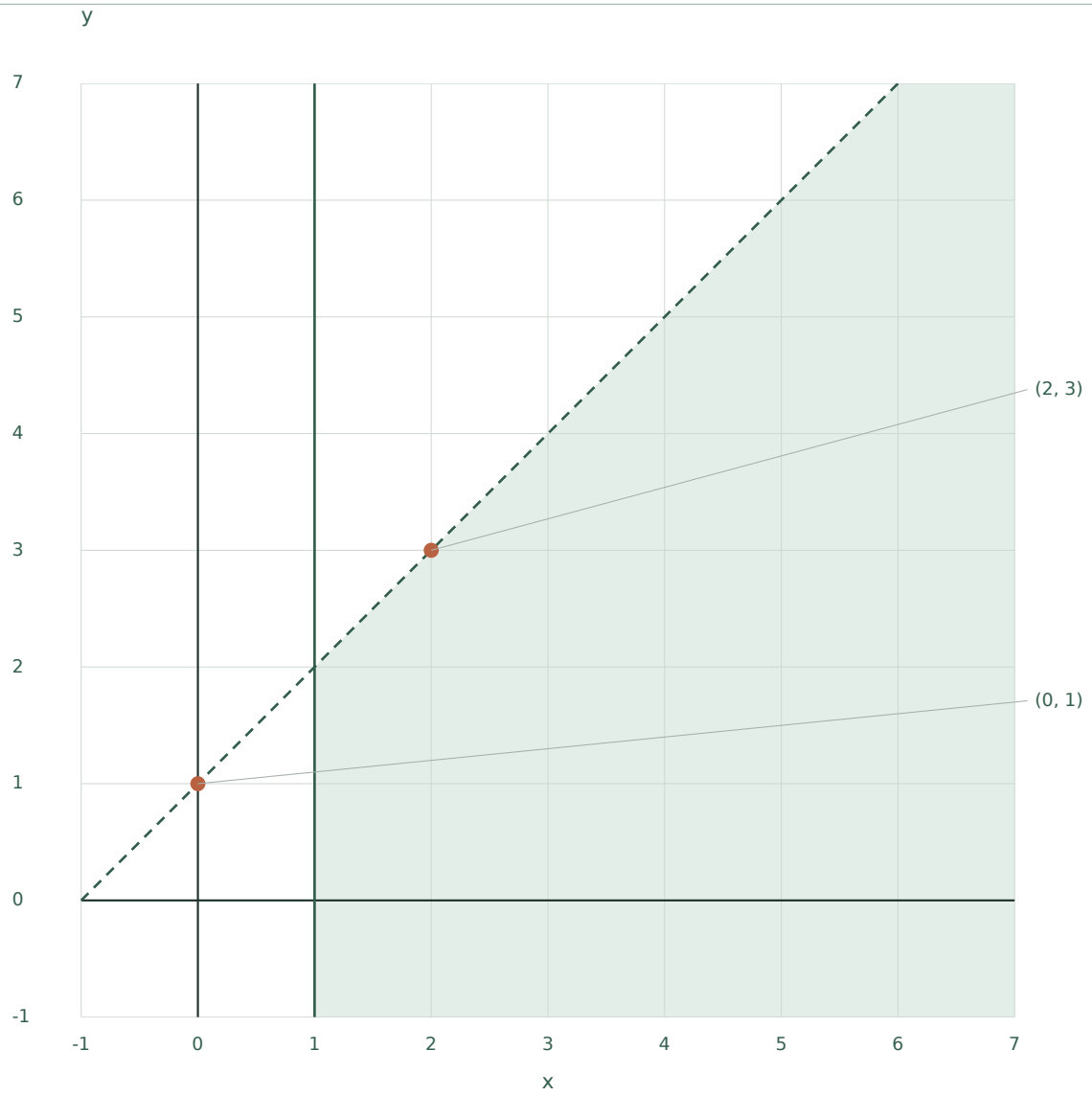
Task 1 / complete graph key



The original complete written system and its checks accompany this graph. Marked points identify boundaries, not solution membership. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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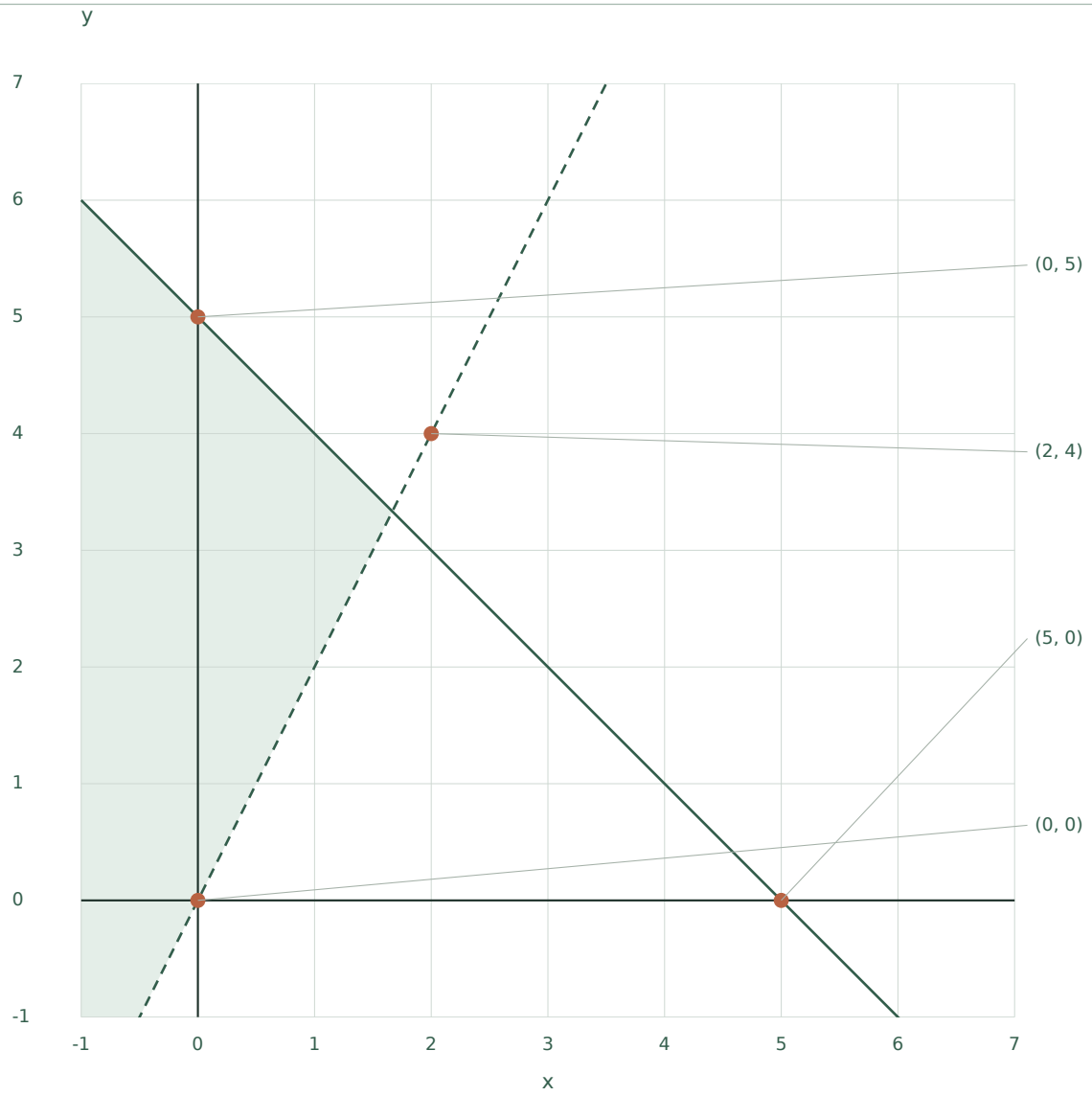
Task 2 / complete graph key



The original complete written system and its checks accompany this graph. Marked points identify boundaries, not solution membership. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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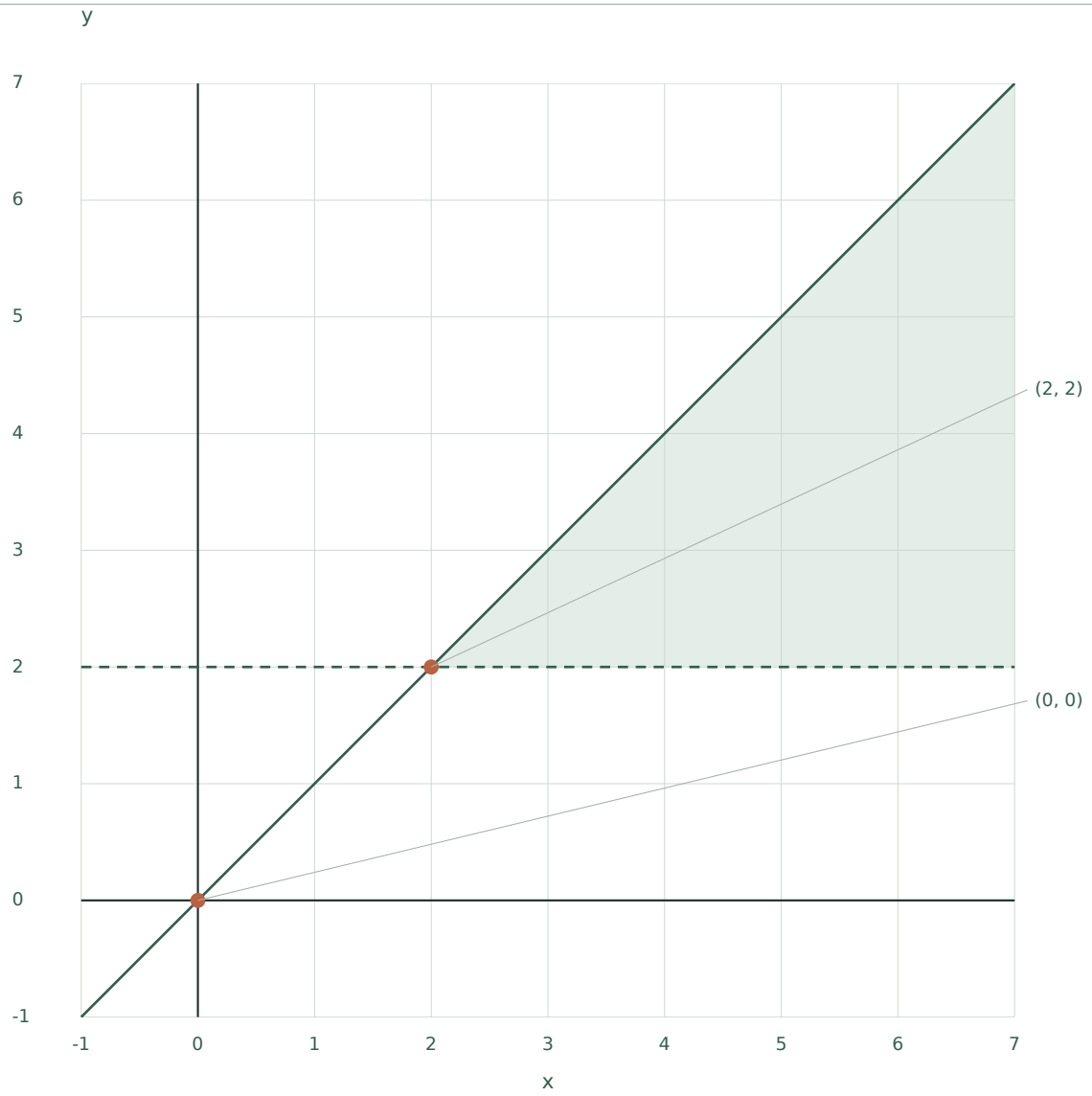
Task 3 / complete graph key



The original complete written system and its checks accompany this graph. Marked points identify boundaries, not solution membership. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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Task 4 / complete graph key



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Source rubric / reflection

- [ ] Correctly identifies both boundary equations in slope-intercept or vertical form.
- [ ] Correctly labels each boundary as solid or dashed and selects ≤/≥ or </> accordingly.
- [ ] Uses at least one test point per boundary to justify the shading direction.
- [ ] Writes the final system as a pair of inequalities joined by 'and'.
- [ ] Verifies one inside point satisfies both inequalities and one outside point fails at least one.
- [ ] Accepts equivalent forms such as $2x - y \geq -1$ for $y \leq 2x + 1$, provided the region is unchanged.

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