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Benchmark 4

(Chapters 7 and 8)

C. Solving Systems of Linear Inequalities (pp. 67–69)

One way to solve a system of inequalities is to graph each inequality. The graph of the system is the intersection of these graphs.

1. Graphing Systems of Two Linear Inequalities

Vocabulary

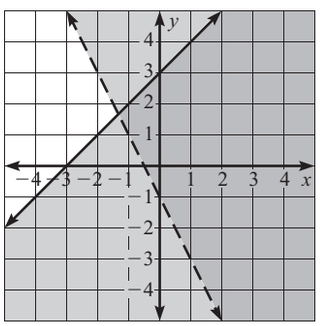
System of linear inequalities Two or more linear inequalities in the same variables; also called a *system of inequalities.*

EXAMPLE

Recall that inequalities with < or > symbols are graphed with dashed lines, while inequalities with ≤ or ≥ symbols are graphed with solid lines.

Graph the system of inequalities.

$y \leq x + 3$ **Inequality 1**
$y > -2x - 1$ **Inequality 2**



Solution:

Graph both inequalities in the same coordinate plane. The graph of the system is the intersection of the two half-planes, which is shown as the darkest gray.

PRACTICE

Graph the system of inequalities.

1. $y > 4x + 1$
$y < -x - 2$

2. $y \geq x - 4$
$y \leq -3x + 4$

3. $x - 2y < -4$
$y \geq -2$

4. $y \leq 2x - 2$
$2x + 3y < 1$

5. $x > -3$
$x \geq -1$

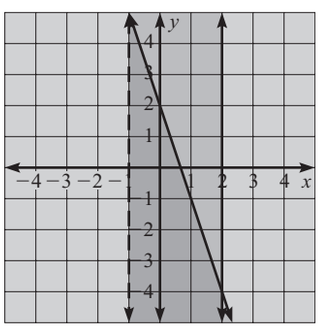
6. $y > 1$
$x \leq 4$

2. Graphing Systems of Three Linear Inequalities

EXAMPLE

Graph the system of inequalities.

$y \leq -3x + 2$ **Inequality 1**
$x > -1$ **Inequality 2**
$x \leq 2$ **Inequality 3**



Solution:

Graph all three inequalities in the same coordinate plane. The graph of the system is the shaded region shown.

PRACTICE

Graph the system of inequalities.

7. $y \geq -2x - 1$
$y \geq 2x - 1$
$y > 4$

8. $y \geq x$
$x < 4$
$y > -1$

9. $y < x + 4$
$4x + y < 4$
$y \geq -4$

10. $y < 2$
$y > 2x$
$y \leq -x + 3$

11. $2x + 3y \leq -2$
$y \geq -2x - 8$
$y > 3x + 6$

12. $x < -3$
$x < 0$
$y \geq 0$

Choose a point in the shaded region and substitute it in each inequality. The solution checks if each substitution results in a true statement.

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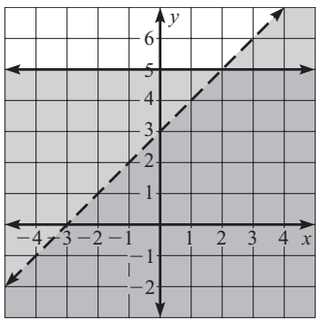
3. Write a System of Linear Inequalities

EXAMPLE **Write a system of inequalities for the shaded region.**

Solution:

Find the equation of the lines from the slope and y-intercept, from two points, or from a point and the slope.



Inequality 1 One boundary line for the shaded region is $y = 5$. Because the shaded region is *below* the *solid* line, the inequality is $y \leq 5$.

Inequality 2 Another boundary line for the shaded region has a slope of 1 and a y-intercept of 3. So, its equation is $y = x + 3$. Because the shaded region is *below* the *dashed* line, the inequality is $y < x + 3$.

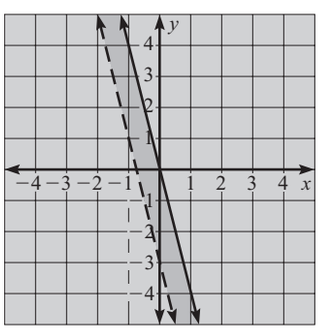
The system of inequalities for the shaded region is:

$y \leq 5$ **Inequality 1**

$y < x + 3$ **Inequality 2**

PRACTICE **Write a system of inequalities for the shaded region.**

13.



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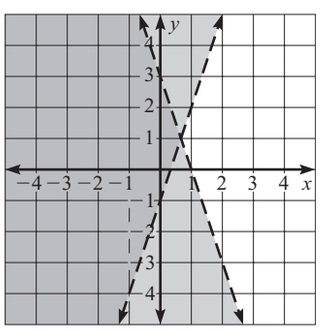

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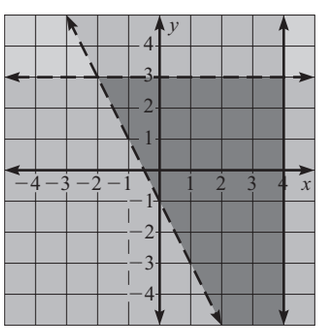

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Quiz

Graph the system of inequalities.

1. $x \leq -5$
$y \geq -1$

2. $x + 2y > -1$
$y > -3$

3. $x + y \geq -2$
$x + y > -6$
$4x + y < -4$

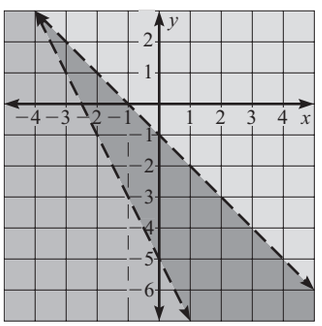
4. $y \geq -2$
$y \leq 1$
$x \geq 0$

5. $x > 1$
$x > 2$
$x > 3$

6. $y < -5x + 3$
$y \leq -4x - 2$
$4x - 3y < -3$

Write a system of inequalities for the shaded region.

7.



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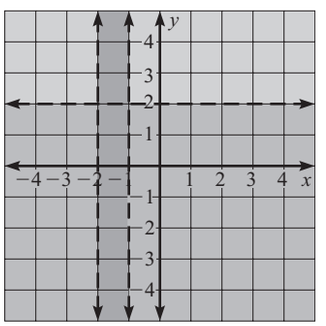

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