# **Lesson Objectives**

1. Solve a linear inequality (in one variable) graphically.
2. Solve a linear inequality (in two variables) graphically.
3. Solve a system of 2 linear inequalities graphically.

# **Solve a Linear Inequality (in One Variable) Graphically**

* **EXAMPLE:** Use the given graph of to solve each equation and inequality in interval notation. [2.3.55]

|  |  |  |
| --- | --- | --- |
|  |  |  |

1. The table below describes what’s happening graphically in the equation

|  |  |  |  |
| --- | --- | --- | --- |
| **LEFT side of the equation** | **symbol** | **RIGHT side of the equation** |  |
|  |  | 0 |
| *y*1 |  | *y*2 |
| The line you’re given | **\_\_\_\_\_\_** | the *x*-axis |

**Big Idea:** “**\_\_\_\_\_\_\_\_\_\_** zero” (*something* = 0) means “**\_\_\_\_** the *x*-axis.”

**WHERE** (what value of *x*) is **the graph ON the *x*-axis**? The solution set is .

1. The table below describes what’s happening graphically in the inequality

|  |  |  |  |
| --- | --- | --- | --- |
| **LEFT side of the equation** | **symbol** | **RIGHT side of the equation** |  |
|  |  | 0 |
| *y*1 |  | *y*2 |
| The line you’re given | **\_\_\_\_\_\_** | the *x*-axis |

**Big Idea:** “**\_\_\_\_\_\_** than zero” (*something* < 0) means “**\_\_\_\_\_\_\_\_\_\_** the *x*-axis.”

**WHERE** (what values of *x*) is **the graph BELOW the *x*-axis**?

The graph is BELOW the *x*-axis if you go to the **\_\_\_\_\_\_\_** of the intersection point, .

In English: to the RIGHT of As inequality: Interval Notation:

1. The table below describes what’s happening graphically in the inequality

|  |  |  |  |
| --- | --- | --- | --- |
| **LEFT side of the equation** | **symbol** | **RIGHT side of the equation** |  |
|  |  | 0 |
| *y*1 |  | *y*2 |
| The line you’re given | on or  **\_\_\_\_\_\_** | the *x*-axis |

**Big Idea:** “**\_\_\_\_\_\_\_\_** than zero” (*something* > 0) means “**\_\_\_\_\_\_\_\_** the *x*-axis.”

**WHERE** (what values of *x*) is **the graph on or ABOVE the *x*-axis**?

The graph is BELOW the *x*-axis if you go to the **\_\_\_\_\_\_\_\_\_** of the intersection point, , with the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

In English: to the LEFT of [included] As inequality:

Interval Notation:

* **EXAMPLE:** Use the given graphs of *y*1 and *y*2 to solve each inequality. Write the solution set in interval notation. [2.3.73]

|  |  |  |
| --- | --- | --- |
|  |  |  |

1. The table below describes what’s happening graphically in the equation

|  |  |  |  |
| --- | --- | --- | --- |
| (left side) | (symbol) | (right side) |  |
|  |  |  |
| blue line |  | redline |
| BLUE | **\_\_\_\_\_** | RED |

**WHERE** (what value of *x*) is **BLUE ON RED**? The solution set for is \_\_\_\_\_\_\_\_\_\_.

1. The table below describes what’s happening graphically in the equation

|  |  |  |  |
| --- | --- | --- | --- |
| (left side) | (symbol) | (right side) |  |
|  |  |  |
| blue line |  | redline |
| BLUE | **\_\_\_\_\_\_\_\_** | RED |

**WHERE** (what values of *x*) is **BLUE ABOVE RED**?

To the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of . Inequality:

The solution set (in interval notation) for is:

1. The table below describes what’s happening graphically in the equation

|  |  |  |  |
| --- | --- | --- | --- |
| (left side) | (symbol) | (right side) |  |
|  |  |  |
| blue line |  | redline |
| BLUE | on or  **\_\_\_\_\_\_\_\_\_** | RED |

**WHERE** (what values of *x*) is **BLUE on or BELOW RED**?

To the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of (included). Inequality: .

The solution set (in interval notation) for is:

# **Solve a Linear Inequality (in Two Variables) Graphically**

**How to graph a linear inequality in two variables:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Step 1** | (If possible) Get your inequality into **\_\_\_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_\_** form.  (Be ready to REVERSE the inequality, if needed!) | | | |
| **Step 2** | Graph the **\_\_\_\_\_\_\_** of boundary line → | **\_\_\_\_\_\_\_\_\_\_\_\_** line (without equals) |  |  |
| **\_\_\_\_\_\_\_\_** line (with equals) |  |  |
| **Step 3** | Choose **\_\_\_\_\_\_\_\_\_\_\_\_** of shading → | | shade **\_\_\_\_\_\_\_\_\_\_**  (greater-than type) | shade **\_\_\_\_\_\_\_** (less-than type) |
| \*exception: for \_\_\_\_\_\_\_\_\_\_ lines () | | shade \_\_\_\_\_\_\_\_\_\_ | shade \_\_\_\_\_\_\_ |

* **EXAMPLE:** Graph the inequality

Use the graphing tool to graph the inequality. [6.2.11]

|  |  |
| --- | --- |
| * **Step 1.** To graph a linear inequality, you need to convert it to **\_\_\_\_\_\_\_\_\_\_-INTERCEPT** form first. | The boundary line and shaded area describe the **solution.** |
| (Subtract 7*x*)  (Simplify) |
| Graph the boundary line:  *y*-intercept: slope:  The symbol used: (\_\_\_\_\_\_\_\_\_\_\_\_\_\_-than)   * **Step 2.** Type of line: \_\_\_\_\_\_\_\_\_\_ (missing equals) * **Step 3.** Direction to shade: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Note: to verify this solution, we use a \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that is \_\_\_\_\_\_\_\_ on the line. Often the origin ( , ) is best to use. If the origin is on the boundary line, then test some other point.

Test it with the inequality: (\_\_\_\_\_\_\_\_\_)

Since testing the origin (0,0) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, that means that the (0,0) region \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ be shaded – the other side will be.

**Big Idea!** Test point \_\_\_\_\_\_\_\_\_ = shade it; Test point \_\_\_\_\_\_\_\_\_\_\_ = don’t shade it

* **EXAMPLE:** Use the graphing tool to graph the given inequality.

|  |  |
| --- | --- |
| [6.2.7] | The boundary line and shaded area describe the **solution.** |
| * **Step 1.** Can’t get this into slope-intercept form because this is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ line.   Graph the boundary line: ***\_\_\_\_\_\_\_\_\_\_\_***  Vertical line passing through the *\_\_\_*-axis at 6 |
| The symbol used: \_\_\_\_\_\_  (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-than or equal to)   * **Step 2.** Type of line: \_\_\_\_\_\_\_\_\_\_\_ (it has equals) * **Step 3.** Direction to shade: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Test point (0,0) into *x* ≥ 6: \_\_\_\_ ≥ 6 (\_\_\_\_\_\_\_\_\_) So, shaded region will \_\_\_\_\_ contain (0,0).

# **Solve a System of 2 Linear Inequalities Graphically**

* **EXAMPLE:** Graph the solution set to the system of inequalities.

Use the graph to identify one solution. Use the graphing tool to graph the system.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| [6.2.23] | | | | Use small arrows on the \_\_\_\_\_\_\_\_\_\_\_\_ of each line to show the direction of the shading.  The region with \_\_\_\_\_ arrows is the solution.  The boundary line and shaded area describe the **solution.** |
| * **Step 1.** Convert each to **SLOPE-INTERCEPT** form: | | | |
|  | |  | |
|  | (subtract 2*x*) |  | (subtract *x*) |
|  | (simplify) |  | (simplify) |
|  | | | |
| Graph the boundary line: | | Graph the boundary line: | |
|  | |  | |
| *y*-intercept: | | *y*-intercept: | |
| slope: | | slope: | |
| The symbol used: \_\_\_\_\_\_  (\_\_\_\_\_\_\_\_\_\_-than) | | The symbol used: \_\_\_\_\_\_  (\_\_\_\_\_\_\_\_\_\_-than) | |
| * **Step 2.** Type of line:   \_\_\_\_\_\_\_\_\_\_ (no equals) | | * **Step 2.** Type of line:   \_\_\_\_\_\_\_\_\_\_ (no equals) | |
| * **Step 3.** Direction to shade: \_\_\_\_\_\_\_\_\_\_\_\_ | | * **Step 3.** Direction to shade: \_\_\_\_\_\_\_\_\_\_\_ | |

* **EXAMPLE:** Graph the system of inequalities. Which graph is the solution of the system?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | [6.2.17] | | **A.**    **B.**    **C.**    **D.** |
| * **Step 1.** Convert each to **SLOPE-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** form. | | | |
|  | |  | |
|  | (subtract *x*) |  | (subtract *x*) |
|  | (simplify) |  | (simplify) |
|  |  |  | (divide by –1) |
|  |  |  | \_\_\_\_\_\_\_\_\_\_\_\_\_! |
| Graph the boundary line: | | Graph the boundary line: | |
|  | |  | |
| *y*-intercept: | | *y*-intercept: | |
| slope: | | slope: | |
| The symbol used: \_\_\_\_\_\_\_  (\_\_\_\_\_\_\_\_-than or equal to) | | The symbol used: \_\_\_\_\_\_\_\_  (\_\_\_\_\_\_\_\_\_\_\_-than or equal to) | |
| * **Step 2.** Type of line:   \_\_\_\_\_\_\_\_\_\_\_\_ (has equals) | | * **Step 2.** Type of line:   SOLID (has equals) | |
| * **Step 3.** Direction to shade: \_\_\_\_\_\_\_\_\_\_\_\_ | | * **Step 3.** Direction to shade: \_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| Use small \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the ends of each line to show direction of shading. The region with TWO arrows is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  The boundary line and shaded area describe the **solution**. Answer is **\_\_\_\_**. | | | |