Introduction to Linear Inequalities

Example 1

\[ x + y > 0 \]

We are looking for all the points (ordered pairs) that satisfy the inequality.

Consider the points below: (Fill in yes or no)

\((-3, 1)\) ________  \((3, 1)\) yes

\((-3, -2)\) ________  \((3, -2)\) ________

\((3, 1)\) satisfies the inequality since \(3 + 1 = 4 > 0\)

What about the other points?
We can’t test every point to see if it satisfies the inequality, so we have a process to find all solutions.

**Step 1:** Graph the boundary line for the inequality.

We do this by making the inequality into an equality

\[ x + y > 0 \quad \rightarrow \quad x + y = 0 \]

To graph the line, we make a chart

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>2</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

We plot the points to draw the line.

**NOTE:** The boundary line is drawn as a **dashed line** whenever you have a strict inequality

\(< \text{ or } >\)

and is drawn as a **solid line** whenever you have

\(\leq \text{ or } \geq\)
**Step 2:** Choose a point not on the boundary line and check to see if it satisfies the inequality.

~ If yes, then shade the region that **includes** the test point.

~ If no, then shade the region that **does not include** the test point.

We know the point \((3, 1)\) satisfies the equation so we shade the region that includes the point \((3, 1)\).
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Graph the inequality

\[ x - y < 1 \]