3(x + 4) - 2 \leq 3x + 10
3x + 12 - 2 \leq 3x + 10
3x + 10 \leq 3x + 10
-3x
10 \leq 10

No Solution
\[ 3x - 4y \leq 9 \]
\[ 3x - 4y = 9 \]
\[ x = \frac{9}{3}, \quad y = -\frac{9}{4} \]
\[ y = \frac{9}{4} \]

Try \((0, 0)\)
\[ 0 \leq 9 \]

True
Shade \text{ ABOVE}
Systems of Linear Inequalities

4. X + Y ≥ 1
5. X - Y > 2
6. X + Y = 1
7. X - Y = 3

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>(0,0)</th>
<th>X</th>
<th>Y</th>
<th>-Y = 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>False</td>
<td>0</td>
<td>-3</td>
<td>True</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>False</td>
<td>3</td>
<td>0</td>
<td>False</td>
</tr>
</tbody>
</table>

Shade above

Shade below
7.6

A linear programming problem consists of:

1. An objective function, a function you wish to either maximize or minimize.
   - Ex: Maximize Profit
   - Minimize Cost

2. A set of constraints (restrictions), a system of linear inequalities.
Maximize: \( P = 2x + 4y \)

Subject to:

1. \[ 2x + 3y \leq 12 \]
2. \[ 2x + y \leq 8 \]
3. \[ x \geq 0 \]
4. \[ y \geq 0 \]

1. Graph the constraints

1. \[ x \geq 0 \]
2. \[ y \geq 0 \]

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
<th>( x+y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Constraints:

- \[ 2x + 3y = 12 \]
- \[ 2x + y = 8 \]

True

Shade Below

Shade Below
Feasible set (region) - set of all possible solutions

1. \(2x + 3y = 12\)
2. \(2x + y = 8\)
3. \(2x + 3y = 12\)

Multiply \(\text{by -1}\): \(-2x - y = -8\)

\(2y = 4\)
\(y = 2\)

\(x = 3\)
From the theory of linear programming, we know that the optimal or best solution will occur at a corner point (vertex) of the feasible region.

<table>
<thead>
<tr>
<th>Corner Point</th>
<th>( P = 2X + 4Y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>((0,0))</td>
<td>( P = 0 + 0 = 0 )</td>
</tr>
<tr>
<td>((4,0))</td>
<td>( P = 2(4) + 0 = 8 )</td>
</tr>
<tr>
<td>((0,4))</td>
<td>( P = 0 + 4(4) = 16 )</td>
</tr>
<tr>
<td>((3,2))</td>
<td>( P = 2(3) + 4(2) = 14 )</td>
</tr>
</tbody>
</table>

When \( x = 0 \) and \( y = 4 \), we get a maximum value of \( P = 16 \).
Monday
(no class Wed) 11/23
7.5 Those assigned Worksheet 1-3 all
7.6 # 9