March 23 Sudoku due

4.1 (20)

| $x + 5y \leq 200$ |
| $2x + 3y \leq 134$ |
| $x \geq 0$ |
| $y \geq 0$ |

Quadrant I

4.2 (20)

| $x + 5y = 200$ |
| $2x + 3y = 134$ |

<table>
<thead>
<tr>
<th>$x$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>200</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>67</td>
</tr>
</tbody>
</table>

$(0,0)$

$0 \leq 200$

True

$(0,0)$ is in the solution set

Shade below

$(0,10)$

$0 \leq 134$

True

$(0,10)$ is in solution set

Shade below
Linear Programming Problem

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

2. A set of constraints (restriction) - a system of linear inequalities
maximize: \[ f = 2x + y \]

Subject to the constraints:

1. \[-x + y \leq 2\]
2. \[x + 2y \leq 10\]
3. \[3x + y \leq 15\]
4. \[x \geq 0\]
5. \[y \geq 0\]

Step 1: Graph the constraints:

- \(-x + y = 2\)
- \(x + 2y = 10\)
- \(3x + y = 15\)

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
<th>(x)</th>
<th>(y)</th>
<th>(x)</th>
<th>(y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>0</td>
<td>0.5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

True

(0,0) is in sol.
Shade Below

0 \leq 10
True
(0,0) in sol.
Shade Below

0 \leq 15
True
(0,0) in sol.
Shade Below
Step 1: Find corner points of the feasible set.

From the theory of linear programming, we know that the optimal (max) solution will occur at a corner point of the feasible set.

Step 2: Substitute corner points into objective function:

Corner points: \( f = 3x + y \)

- (0, 0): \( f = 0 + 0 = 0 \)
- (0, 2): \( f = 0 + 2 = 2 \)
- (1, 0): \( f = 3(1) + 0 = 3 \)
- (2, 1): \( f = 2(2) + 1 = 5 \)
- (2, 3): \( f = 2(2) + 3 = 7 \)
- (4, 3): \( f = 2(4) + 3 = 11 \)

Step 3: Write solution:

If \( x = 4 \) and \( y = 3 \), then we have a maximum value of \( f = 11 \).
4.2

13. \( x + 3y \geq 6 \)
2. \( 2x + 4y \geq 10 \)
3. \( 3x + y \geq 5 \)

\( x = 0 \)
\( y = 0 \)  \( \Rightarrow \)  \( \text{Quad IV} \)

\( x + 3y = 6 \)
\( 2x + 4y = 10 \)
\( 3x + y = 5 \)

\( \begin{array}{c|c|c|c}
\text{X} & \text{Y} & \text{Y = 10} & \text{Y = 10} \\
\hline
0 & 5 & 0 & 5 \\
2 & 0 & 5 & 0 \\
\hline
\end{array} \)

\( \frac{3x}{5} = \frac{5}{3} \)
\( x = \frac{5}{3} \)

(0,0)  \( \geq 6 \), \( \text{False} \)
(0,0)  \( \text{not sol.} \)
Shade ABOVE

(0,0)  \( \geq 10 \), \( \text{False} \)
(0,0)  \( \text{not insol} \)
Shade ABOVE

(0,0)  \( \geq 5 \), \( \text{False} \)
(0,0)  \( \text{not insol} \)
Shade ABOVE
Tuesday - March 21

4.2 27, 31, 33
4.3 1 - 15 odd
  19 - 29 odd
  37, 39

Note:
4.3 #13 is 4.2 #21
4.3 #15 is 4.2 #23
4.3 #19 is 4.2 #27
4.3 #37 is 4.2 #31
4.3 #39 is 4.2 #33