1. (6% each) Solve each of the following for \( x \):

a. \( 6x + 3 = 3(x - 7) \)

\[
\begin{align*}
6x + 3 &= 3x - 21 \\
-3x - 3 &= -24 \\
x &= -8
\end{align*}
\]
b. \[4x - 9 = 11\]

\[
\frac{9 + 9}{4x} = 20
\]

\[
\frac{4x}{4} = 5
\]

\[x = 5\]
2. (6%) Solve for \( y \):

\[ 5x - 7y = 12 \]

\[ y = \boxed{\frac{5}{7}x - \frac{12}{7}} \]
3. (6%) Graph the solution set of \(-3x + 17 \leq 4x + 24\) on the real number line.

\[-3x + 17 \leq 4x + 24\]
\[-4x - 4x\]
\[7x + 17 \leq 24\]
\[-7x \leq 7\]
\[x \geq -1\]
4. (6% each) Graph each of the following.

a. \( y = -3x + 2 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
<th>((x, y))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>((0, 2))</td>
</tr>
<tr>
<td>2</td>
<td>-4</td>
<td>((2, -4))</td>
</tr>
</tbody>
</table>
b. $5x - 6y = 12$

$x$  $y$  $(x, y)$
0    -2   (0, -2)
2.4  0    (2.4, 0)

$x = \frac{12}{5} = 2.4$
5. (6%) Graph the inequality \( y \leq 3x + 7 \)

write: \( y = 3x + 7 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
<th>( (x, y) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7</td>
<td>(0, 7)</td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>(2, 13)</td>
</tr>
</tbody>
</table>

"\( \leq \)" solid

check (0,0)

\[ y \leq 3x + 7 \]
\[ 0 \leq 3(0) + 7 \]
\[ 0 \leq 7 \text{ true} \]
6. (10%) Solve the system by the substitution method or the addition method.

\[ x + y = 7 \]

\[ 2x - y = 5 \]

\[ \underline{3x = 12} \]

\[ x = 4 \]

\[ x + y = 7 \]

\[ \text{let } x = 4 \]

\[ 4 + y = 7 \]

\[ y = 3 \]

\[ y = 3 \]
7. (10%) Graph the system of linear inequalities and indicate the solution set.

\[ y < -x + 4 \]
\[ y > 2x - 3 \]
8. (3% each) Use one of the following terms in each of your answers: variable, constant, algebraic expression, ratio, proportion, consistent, inconsistent, graph, vertices, boundaries, feasible region, objective function, collinear, equivalent equations
   a. A system of equations that has no solution is said to be **inconsistent**.
      [If it has any solution, it is ] **consistent**.
   b. A **proportion** is a statement of equality between two ratios.
      [A ratio is one number divided by another.]
c. A **graph** is an illustration of all points whose coordinates satisfy an equation.

d. An **algebraic expression** is a collection of variables, numbers, parentheses, and operation symbols.
e. In a linear programming program, **vertices** are points where two or more boundaries intersect.

f. A **constant** is a symbol used to represent a specific quantity.

**Equivalent equations** are equations that have the same solution.

Points are **collinear** if they all lie on the same line.
9. (10%) The length of a garden is 5 feet more than three times the width. If the perimeter of the garden is 154 feet, find the dimensions.

\[ l = 3w + 5 \]
\[ P = 2l + 2w \]
\[ 154 = 2(3w + 5) + 2w \]
\[ 154 = 6w + 10 + 2w \]
\[ 154 = 8w + 10 \]
\[ -10 \]
\[ 144 = 8w \]
\[ \frac{144}{8} = w \]
\[ 18 = w \]
10. (15%) The set of constraints and profit formula for a linear programming problem are:

\[
\begin{align*}
&x \geq 0 \\
y \geq 0 \\
x + 2y \leq 7 \\
2x + y \leq 5 \\
P = 2x + 6y
\end{align*}
\]

\[\text{first quadrant}\]

\(\text{find int.}\)

\(\text{6 of 2 lines}\)

\(\text{check } (0,0)\)

\(x + 2y \leq 7\)

\(\text{this side}\)

\(2x + y \leq 5\)

\(\text{true}\)
a. Draw the graph of the constraints and determine the vertices of the polygonal region.

\[(0,0), (2.5,0), (0,3.5)\] and \[(1,3)\]

\[x+2y = 7\] (multiplied by 2)
\[2x+y = 5\]

\[x+2y = 7\]  \(x+2(3) = 7\) \(x = 1\)

b. Use the vertices to determine the maximum profit.

<table>
<thead>
<tr>
<th>Vertices</th>
<th>Calculate (P = 2x + 6y)</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0,0)</td>
<td>2(0) + 6(0)</td>
<td>0</td>
</tr>
<tr>
<td>(2.5,0)</td>
<td>2(2.5) + 6(0)</td>
<td>5</td>
</tr>
<tr>
<td>(0,3.5)</td>
<td>2(0) + 6(3.5)</td>
<td>21</td>
</tr>
</tbody>
</table>
| (1,3)    | 2(1) + 6(3)              | 20   | maximum profit