Math 1324  
Exam #3 Review  
Sections 6.1, 6.2, and 7.1-7.5

In problems 1 & 2, solve each system of linear equations using matrices and Gauss-Jordan Elimination

1. \[
\begin{align*}
    x - y + 2z &= -3 \\
    x + 2y + 3z &= 4 \\
    2x + y + z &= -3
\end{align*}
\]

2. \[
\begin{align*}
    x + y + z &= 7 \\
    3x - 2y + z &= 3 \\
    x + 6y + 3z &= 25
\end{align*}
\]

In problems 3-5, set-up the systems of linear equations that can be used to solve the following application problems and use a TI-83 to solve.

3. One serving of tomato soup contains 100 Cal and 18 g of carbohydrates. One slice of whole wheat bread contains 70 Cal and 13 g of carbohydrates. How many servings of each would be required to obtain 230 Cal and 42 g of carbohydrates?

4. Considering an 8-oz serving size, 1 serving each of coffee, Red Bull, and Mountain Dew soda contains 197 mg of caffeine. One serving of coffee has 6 mg more caffeine than two servings of Mountain Dew. One serving of Red Bull contains 37 mg less caffeine than one serving of coffee and Mountain Dew combined. Find the amount of caffeine in each beverage.

5. On an 18-hole golf course, there are par 3-holes, par 4-holes, and par 5-holes. A golfer who shoots par on every hole has a score of 72. The sum of the number of par 3-holes and the number of par 5-holes is 8. How many of each type of hole are there on the golf course?

In problems 6 & 7, solve each linear programming problem using the graphical method.

6. A farmer has 70 acres of land available for planting either soybeans or wheat. The cost of preparing soil, the workdays required, and the expected profit per acre planted for each type of crop are given in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Soybeans</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation cost per acre</td>
<td>$60</td>
<td>$30</td>
</tr>
<tr>
<td>Workdays required per acre</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Profit per acre</td>
<td>$180</td>
<td>$100</td>
</tr>
</tbody>
</table>

The farmer cannot spend more than $1800 in preparation costs nor more than a total of 120 workdays. How many acres of each crop should be planted in order to maximize the profit? What is the maximum profit?
7. Kevin’s dog Amadeus likes two kinds of canned dog food, “Gourmet Dog” costs 40 cents a can and has 20 units of a vitamin complex; the calorie content is 75 calories. “Chow Hound” costs 32 cents a can and has 35 units of vitamins and 50 calories. Kevin likes Amadeus to have at least 1175 units of vitamins a month and at least 2375 calories during the same period of time. Kevin has space to store only 60 cans of dog food at a time. How much of each kind of dog food should Kevin buy each month in order to minimize his cost?

In problems 8 & 9, solve each linear programming problem using the simplex method.

8. Maximize \( z = x_1 + 5x_2 - 10x_3 \)
   \[
   \begin{align*}
   & \text{Subject to: } \\
   & 8x_1 + 4x_2 + 12x_3 \leq 18 \\
   & x_1 + 6x_2 + 2x_3 \leq 45 \\
   & 5x_1 + 7x_2 + 3x_3 \leq 60 \\
   & x_1 \geq 0, x_2 \geq 0, x_3 \geq 0
   \end{align*}
   \]

9. Roberta Hernandez sells three items-A, B, and C in her gift shop. Each unit of A costs her $2 to buy, $1 to sell, and $2 to deliver. For each unit of B, the costs are $3, $2, and $2, respectively, and for each unit of C, the costs are $6, $2, and $4 respectively. The profit on A is $4, on B it is $3, and on C $3. How many of each item should she order to maximize her profit if she can spend $1200 to buy, $800 to sell, and $500 to deliver?