Homework 1 (Due Thursday, Feb 11)

1. Exercises 1.1, Problem 11
   A company has $36,000 to hire a mathematician and his/her secretary. Out of respect for the mathematician’s training, the mathematician will be paid $8000 more than the secretary. How much will each be paid? (Use two variables to formulate equations.)

2. Exercises 1.1, Problem 22
   Suppose that factory A produces 12 tables and 6 chairs an hour while factory B produces 8 tables and 4 chairs an hour. How many hours should each factory work to produce 48 tables and 24 chairs? How many different integer solutions are there to this problem?

3. Exercises 1.2, Problem 4
   Consider the following oil refinery model. The table gives the production of Heating oil, Diesel oil and Gasoline in gallons from 1 barrel of crude petroleum for each of the 3 refineries. Table also shows the demand for each product.

<table>
<thead>
<tr>
<th></th>
<th>Refinery 1</th>
<th>Refinery 2</th>
<th>Refinery 3</th>
<th>Consumer Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating Oil</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>280</td>
</tr>
<tr>
<td>Diesel Oil</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>350</td>
</tr>
<tr>
<td>Gasoline</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>350</td>
</tr>
</tbody>
</table>

How many barrels of petroleum should each refinery process in order to meet the demand? (If you choose to solve this problem by trial – error method given in the textbook, then no product should be off by more than 30 gallons from it’s demand.)

4. Exercises 1.2, Problem 10
   Consider the Leontief economic model we discussed in class. Start the iterations with the initial values: $x_1 = 100, x_2 = 50, x_3 = 100, x_4 = 0$. Carry out five iterations.

   (Carry out the first iteration by hand computations to demonstrate Matrix – Vector multiplication. For the next four iterations, you can use a software like MATLAB. If you are not conversant with any matrix software, MS-Excel has the facility to compute matrix multiplications.)

5. Exercises 1.3, Problem 3a, b
   In the Frog Markov chain, what is the probability distribution in the next period if the current distribution is:
   (a) $p_3 = 1$, all other $p_i = 0$?
   (b) $p_2 = .5, p_3 = .5$, all other $p_i = 0$?

6. Exercises 1.3, Problem 5
   If the local professional basketball team, the Sneakers, wins today’s game, they have a $2/3$ chance of winning their next game. If they loose this game, they have a $\frac{1}{2}$ chance of winning their next game.
   (a) Give the Transition matrix and draw the transition diagram.
   (b) If there is a $50 – 50$ chance of winning today’s game, what are the chances of winning the next game?
   (c) If they won today, what are the chances of winning the game after the next?