Math 1119B, Tutorial 6

Monday, November 28, 2011

1. Solve the following equation for x

$$\begin{vmatrix} x+1 & 4 & 7 \\ 0 & 3x & -4 \\ 0 & 0 & -2x+3 \end{vmatrix} = 0.$$

2. (a) Use Cramer's rule to solve for x_1 and x_3 in the equation

$$\begin{bmatrix} 1 & 0 & -2 \\ 0 & 2 & -3 \\ 3 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ 2 \end{bmatrix}.$$

(b) Use Cramer's rule to solve for x_2 when

$$A = \begin{bmatrix} 0 & 1 & -1 \\ 1 & 2 & -3 \\ -2 & 0 & 4 \end{bmatrix}, \qquad b = \begin{bmatrix} 3 \\ -1 \\ -4 \end{bmatrix}.$$

3. Find the steady-state of the following stochastic matrix:

$$\begin{bmatrix} 1 & .2 & .3 \\ 0 & .3 & .5 \\ 0 & .5 & .2 \end{bmatrix}.$$

4. **Real-world numbers estimated from www.netmarketshare.com**. There are three major third-party browsers used on PCs today, Opera, Google Chrome and Mozilla Firefox. Opera currently has a 1.6% browser share, Google Chrome has a 17.6% browser-share and Mozilla Firefox has a 22.5% market share. This year, 90% of Opera users stay as Opera users, with 8% moving to Google Chrome and 2% switching to Firefox. Chrome maintains 95% of its users and an additional 3% switching to Firefox. Finally, Firefox keeps only 80% of its users, with 12% moving to Chrome.

(a) Set up the stochastic matrix P.

(b) Find the state vectors v_1. (**Be careful!** What do you notice about the vector v_0?)

5. (a) Find the steady-state of the following matrix

$$P = \begin{bmatrix} .2 & .3 \\ .8 & .7 \end{bmatrix}.$$

(b) If $v_0 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$, find v_1, v_2, v_3. Compare these to your steady state vector.

(c) Repeat (b) with $w_0 = \begin{bmatrix} .5 \\ .5 \end{bmatrix}$.