

Math 1119B, Tutorial 7

Monday, December 5, 2011

This is the final tutorial of the year. Here are a few sample questions.

Please take this opportunity to ask your TA about some of the problems you may be having with the content throughout the year. That is precisely what they are there for.

1. Let

$$A = \begin{bmatrix} 1 & -1 & 4 & 11 & 4 & -1 \\ 1 & -1 & 4 & 11 & 4 & 1 \\ 0 & 4 & 3 & 9 & 7 & 4 \\ 0 & 4 & 2 & 6 & 6 & 6 \end{bmatrix}.$$

1. Use Gaussian elimination to reduce the matrix to row-echelon form.

2. What is the dimension of $\text{Col}(A)$ and $\text{Row}(A)$?

3. Use the rank theorem to determine the dimension of $\text{null}(A)$.

4. Solve the system $Ax = 0$ (Hint: Finish Gauss-Jordan elimination).

5. Using the above work, determine if $\begin{bmatrix} -1 \\ 1 \\ -2 \\ 6 \end{bmatrix}$ is in $\text{Span} \left\{ [1 \ 1 \ 0 \ 0]^T, \begin{bmatrix} -1 \\ -1 \\ 0 \\ 4 \end{bmatrix}, \begin{bmatrix} 4 \\ 4 \\ 1 \\ 2 \end{bmatrix} \right\}$.

6. Determine constants such that $v_4 = c_1v_1 + c_2v_2 + c_3v_3$.

7. Repeat this for v_5 .

8. Give two bases for $\text{Row}(A)$. Your second basis should contain at least 12 zeroes.

2. Let $P = \begin{bmatrix} .5 & 0 & .5 \\ 0 & .2 & 0 \\ .5 & .8 & .5 \end{bmatrix}$ be a stochastic matrix, and let the initial state $v_0 = \begin{bmatrix} .2 \\ .3 \\ .5 \end{bmatrix}$.

1. Find the state after 2 iterations v_2 .

2. Find a steady-state vector q by solving $(I - P)x = 0$.

3. Let B be a 3×3 matrix with determinant equal to -2 and let

$$C = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 2 & 3 \\ -1 & 3 & 2 \end{bmatrix}.$$

- Find $\det(2A^T B^3)$.