Dr. Wolfe MATH 461 MATLAB PROJECT #2 Due November 6, 2002

1. Consider Ex. 2, p.296 *Lay*. The stochastic matrix for this problem is

$$P = \begin{pmatrix} .50 & .25 & .25 \\ .25 & .50 & .25 \\ .25 & .25 & .50 \end{pmatrix}$$

(a) Type **P^2** to calculate P^2.

(b) Use P and P^2 to answer the following questions. Suppose an animal chooses food #1 on the initial trial. What is the probability that the animal will:

(i) choose food #2 on the next trial ?

(ii) choose food #2 on the second trial after the initial trial?

(iii) choose food #3 on the second trial after the initial trial?

(c) Type **I=eye(3), rref(P-I)**to calculate the reduced echelon form of $P-I$. Record this and use it to write the <u>general solution</u> $\mathbf{x}$ to the system $(P-I)\mathbf{x} = \mathbf{0}$. Also choose a nonzero value for the free variable and write a <u>particular solution</u> $\mathbf{w}$. To calculate the steady state vector $\mathbf{q}$ for P enter your solution $\mathbf{w}$ and type **q=w/sum(w)**. Explain why $\mathbf{q}$ is a probability vector and verify that $\mathbf{q}$ satisfies $P\mathbf{q} = \mathbf{q}$.

2. Ex.4, p.296, *Lay*. Also answer the following question. In the long run what is the probability that the weather will be <u>good</u> on any given day ? (Show all calculations.)

3. Ex.21, p.297, *Lay*. In part (a) to compute the steady state vector write **R=rref(P-eye(4))** Then

$$\mathbf{w} = [-\mathbf{R}(\mathbf{1}:\mathbf{3},\mathbf{4});\mathbf{1}],\ \ \mathbf{q} = \mathbf{w}/\mathbf{sum}(\mathbf{w}).$$