Dr. Wolfe MATH 240 MATLAB PROJECT \#2 Due October 28, 2004

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

$$
P=\left(\begin{array}{lll}
.50 & .25 & .25 \\
.25 & .50 & .25 \\
.25 & .25 & .50
\end{array}\right)
$$

(a) Type $\mathbf{P}^{\wedge} \mathbf{2}$ 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 $\mathbf{I}=\mathbf{e y e}(\mathbf{3}), \operatorname{rref}(\mathbf{P}-\mathbf{I})$ to calculate the reduced echelon form of $P-I$. Record this and use it to write the general solution $\mathbf{x}$ to the system $(P-I) \mathbf{x}=\mathbf{0}$. Also choose a nonzero value for the free variable and write a particular solution $\mathbf{w}$. To calculate the steady state vector $\mathbf{q}$ for $P$ enter your solution w and type $\mathbf{q}=\mathbf{w} / \operatorname{sum}(\mathbf{w})$. 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 good on any given day? (Show all calculations.)
3. Ex. 21 , p. 297 Lay. In part (a) to compute the steady state vector write $\mathbf{R}=\mathbf{r r e f}(\mathbf{P}$ eye(4)) Then

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

