M146 Assignment IV Due Thurs April 20, 2006

Vectors and Matrices. Leslie Matices.

Section 56 (page 639) 1, 4

(1) Reduce $\left[\begin{array}{cc|c} 1 & 1 & 3 \\ 1 & 5 & 7 \end{array}\right]$ to echelon form; then find all solutions of

$$\begin{array}{rcrcr} x_1 & + & x_2 & = & 3 \\ x_1 & + & 5x_2 & = & 7 \end{array}$$

(3) Reduce $\left[\begin{array}{rrr|r} -1 & -2 & 3 & -9 \\ 2 & 1 & -1 & 5 \\ 4 & -3 & 5 & -9 \end{array}\right]$ to echelon form; then find all solutions of

$$\begin{array}{rcrcrcr} -x_1 & + & -2x_2 & + & 3x_3 & = & -9 \\ 2x_1 & + & x_2 & + & -x_3 & = & 5 \\ 4x_1 & + & -3x_2 & + & 5x_3 & = & -9 \end{array}$$

(4a) Find all solutions of $\begin{array}{rcrcr} 2x_1 & + & 4x_2 & = & 4 \\ 3x_1 & + & 6x_2 & = & 1 \end{array}$

(4b) Find all solutions of $\begin{array}{rcrcr} 2x_1 & + & 4x_2 & = & 0 \\ 3x_1 & + & 6x_2 & = & 0 \end{array}$

(5) Find all solutions of $\begin{array}{rcrcrcr} 3x_1 & + & 4x_2 & + & 2x_3 & = & 2 \\ 6x_1 & + & 9x_2 & + & 5x_3 & = & 6 \end{array}$

(6) A population is divided into calves, yearlings, adults. The Leslie matrix for this population distribution is: $L = \begin{bmatrix} 0 & 0 & 2.5 \\ 0.6 & 0 & 0 \\ 0 & 0.4 & 0.4 \end{bmatrix}$.

(6a) Describe the meaning of each of the numbers in this matrix.

(6b) One eigenvalue (the largest) for L is $\lambda = 1.0$. Find a vector $x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$, with $x_1 + x_2 + x_3 = 1000$ so that $Lx = 1.0x$

(6c) A vector of numbers $p = (p_1, p_2, p_3)$ with $Lp = p$ and $p_1 + p_2 + p_3 = 1$ is called the **stable distribution**. What are the percentages of calves, yearlings and adults in the stable distibution?

M146 Sample #04 for Quiz April 20, 2006 Name: ....

(1) find all solutions of
$$\begin{array}{rcrcl} x_1 & + & 2x_2 & = & 1 \\ 2x_1 & + & 7x_2 & = & 8 \end{array}$$

(2) $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$ $\quad b = \begin{bmatrix} 1 \\ 3 \end{bmatrix}$. Calculate $A \cdot b$.

(3) Find all solutions of
$$\begin{array}{rcrcl} 1x_1 & + & 2x_2 & = & 4 \\ 3x_1 & + & 6x_2 & = & 1 \end{array}$$

(4) Find all solutions of
$$\begin{array}{rcrcl} 1x_1 & + & 2x_2 & = & 0 \\ 3x_1 & + & 6x_2 & = & 0 \end{array}$$

(5a) Let $A = \begin{bmatrix} 1 & -1 & 4 \\ -2 & 1 & 3 \\ 3 & 2 & -5 \end{bmatrix}$ and $b = \begin{bmatrix} 1 \\ 3 \\ -2 \end{bmatrix}$. Calculate $A \cdot b$.

(5b) Let $A = \begin{bmatrix} 1 & -1 & 4 \\ -2 & 1 & 3 \\ 3 & 2 & -5 \end{bmatrix}$ and $b = \begin{bmatrix} 1 \\ 3 \\ -2 \end{bmatrix}$. Find all solutions to $Ax = b$.

(6) A population is divided into calves, yearlings, adults. The Leslie matrix for this population distribution is: $L = \begin{bmatrix} 0 & 0 & 2.5 \\ 0.5 & 0 & 0 \\ 0 & 0.4 & 0.5 \end{bmatrix}$.

(6a) Describe the meaning of each of the numbers in this matrix.

(6b) The inutial population distribution is $\begin{bmatrix} 100 \\ 100 \\ 200 \end{bmatrix}$. What happens after 1 year? 2 years?

(6c) One eigenvalue (the largest) for L is $\lambda = 1.0$. Find a vector $x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$, with $x_1 + x_2 + x_3 = 760$ so that $Lx = 1.0x$