

Assignment 4

Math 345, Prof. Shi

Due: Wednesday , Oct 4 (11am)

1. Textbook page 21 1.12.

Use $F(N) = (1 - N/K)(N/U - 1)$ with $r > 0$ and $0 < U < K$ for critical depensation, and $F(N) = r(1 - N/K)(N/U - 1)$ with $r > 0$ and $U < 0 < K$ for non-critical depensation. Note that there are two equilibrium points in this case, and use each of them as N^* in the yield.

2. Calculate by hand:

Let $A = \begin{pmatrix} 2 & 5 \\ 8 & -2 \end{pmatrix}$, $B = \begin{pmatrix} 3 & -1 \\ 6 & 9 \end{pmatrix}$, and $C = \begin{pmatrix} 5 \\ -3 \end{pmatrix}$. Find $A + B$, A^2 , $A * B$, and the solution x of $Ax = C$.

3. Calculate use matlab:

Let $A = \begin{pmatrix} -2 & 3 & 0 \\ 5 & 7 & 9 \\ 2 & -4 & 11 \end{pmatrix}$, $B = \begin{pmatrix} 13 & -2 & 81 \\ -32 & 78 & 20 \\ 7 & 10 & -19 \end{pmatrix}$ and $C = \begin{pmatrix} 7 \\ 10 \\ -23 \end{pmatrix}$. Find $A + B$,

$A - B$, A^2 , $A * B$, the solution x of $Ax = C$, the solution y of $(3A - 2B)y = 5C$, and the solution z of $A^T z = C$ (where A^T is the transpose of A). (You do not need to print out all matlab codes and output.)

4. Use Matlab to plot the graph of $y = 2x - \sin x$ on interval $[0, 11]$ and the graph of the data set:

x	0	1	2	3	4	5	6	7	8	9	10	11
y	-2	3	-12	20	7	9	0	-3	4	-2	8	5

The two graphs should be in the same figure, and print it. (not necessarily color printing)

5. The following data taken from the 1996 Information Please Almanac show U.S. population from 1800 to 1860, just prior to the Civil War.

year	1800	1810	1820	1830	1840	1850	1860
population in million	5.31	7.24	9.64	12.87	17.07	23.19	31.44

Use logistic equation to fit the data by assuming the carrying capacity to be 500 millions, find N_0 and λ , and use the solution to predict the population in year 2000. How good is this prediction? Suggest a better carrying capacity which may obtain better prediction today.