Homework Five

1) and 2)  
Text, Page 75, 2.3.5, 2.3.7  

2) (basic) The island of Rhum off Scotland is a nature preserve. The red deer population has been thinned so that vegetation can recover from over-grazing. Is the thinning working?

One way to answer this is to compute the growth rate, \( r \), from the age matrix. If the rate \( r \) is too much less than one, the deer population will go extinct. If \( r \) is too much greater than one, the population will increase too quickly.

Here is the matrix defining the population grown among age groups.

\[
\begin{array}{cccccccccc}
0 & 0 & .26 & .26 & .26 & .35 & .26 & .31 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & .26 \\
0 & .94 & 0 & 0 & 0 & 0 & 0 & 0 & .31 \\
0 & .80 & 0 & 0 & 0 & 0 & 0 & 0 & .35 \\
0 & 0 & .67 & 0 & 0 & 0 & 0 & 0 & .26 \\
0 & 0 & 0 & .61 & 0 & 0 & 0 & 0 & .31 \\
0 & 0 & 0 & 0 & .63 & 0 & 0 & 0 & .36 \\
0 & 0 & 0 & 0 & 0 & .72 & 0 & 0 & .35 \\
0 & 0 & 0 & 0 & 0 & 0 & .22 & 0 & .35 \\
\end{array}
\]

The matrix above has been put online so you can import it into Matlab. You can simply copy-and-paste from red.doc, or you can use the `load` command on red.txt.

a) In either case, estimate the reproductive rate \( r \) by iterating the population size until it stabilizes, as we did in class. What is the normalized) stable population?

b) Use Matlab to estimate the largest eigenvalue, and use that to find the reproductive rate \( r \).