

## Math 2114 Homework 9 Spring 2018

Follow homework requirements to get full credit.

**Problem 1:** Given the information matrix 
$$\begin{array}{c} \left[ \begin{array}{cc} \textit{from} & \textit{to} \\ \textit{city} & \textit{suburbs} \\ .95 & .03 \\ .05 & .97 \end{array} \right] \begin{array}{c} \\ \\ \textit{city} \\ \textit{suburbs} \end{array} \end{array},$$

let  $M = \begin{bmatrix} .95 & .03 \\ .05 & .97 \end{bmatrix}$  be the transition matrix that illustrates the movement between populations in the city and suburbs. Total population is 600,000 in the city and 400,000 in the suburbs.

Now choose one arbitrary person in the city and determine the likely hood that he will move to the suburbs in one year and then determine the likelihood he will move in two years. Let the initial vector  $x_0 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ .

**Problem 2:** Determine if  $q = \begin{bmatrix} .3 \\ .7 \end{bmatrix}$  is a steady-state vector for  $P = \begin{bmatrix} .6 & .2 \\ .4 & .8 \end{bmatrix}$ .

**Problem 3:** Give the matrix  $A = \begin{bmatrix} 1 & 5 \\ -2 & 3 \end{bmatrix}$

- 1) Find the eigenvalues and eigenvectors
- 2) Using the eigenvector associated with  $\lambda = a - bi$  for A, find the matrix P and  $P^{-1}$  so that the rotation matrix  $C = P^{-1}AP$
- 3) Using C from part 2), find the angle of rotation for the linear transformation  $T(x) = Ax$ . Remember that C and A are similar matrices and have the same eigenvalues.