

# Numerical Analysis

MAT 542 – FALL 2010

Homework # 4 Due September 22

1. Compute the eigenvalues and associated eigenvectors for the matrices below.

$$\mathbf{A} = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}, \quad \mathbf{C} = \begin{bmatrix} 0 & \frac{1}{2} \\ \frac{1}{2} & 0 \end{bmatrix}$$

2. Find all of the Gershgorin discs for the following matrices. Indicate the smallest region(s) containing all of the eigenvalues.

$$\mathbf{A} = \begin{bmatrix} 3 & -1 & 1 \\ 2 & 4 & -2 \\ 3 & -1 & 9 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 3 & 1 & 2 \\ -1 & 4 & -1 \\ 1 & -2 & 9 \end{bmatrix}, \quad \mathbf{C} = \begin{bmatrix} 1 & 0 & 0 \\ -1 & 0 & 1 \\ -1 & -1 & 2 \end{bmatrix}$$

3. (**Graduate**) Consider the matrix  $\mathbf{A}$  given below. Plot the Gershgorin discs in the complex plane for  $\mathbf{A}$  and  $\mathbf{A}^T$  as well as indicate the locations of the eigenvalues.

$$\mathbf{A} = \begin{bmatrix} 4 & -\frac{1}{2} & 0 \\ \frac{3}{5} & 5 & -\frac{3}{5} \\ 0 & \frac{1}{2} & 3 \end{bmatrix}$$