

**MTH 370, Fall 2009**  
**Homework 3**

**Instructions:** Do these calculations by hand (you may use a computer or calculator for simple arithmetic and function evaluations) and show your work.

1. Let

$$A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

(a) Show that  $AB$  does not equal  $BA$ . [Note: this is unlike the multiplication of the real numbers  $a$  and  $b$ , where  $ab = ba$  always. We say that the matrices  $A$  and  $B$  do not *commute* under multiplication.]

(b) Find a matrix  $C \neq A$  that commutes with  $A$ , that is,  $AC = CA$ .

2. Let

$$A = \begin{bmatrix} 7 & 2 \\ 2 & 7 \end{bmatrix}$$

Find the eigenvectors and associated eigenvalues of  $A$ .

3. Let

$$A = \begin{bmatrix} 0.5 & -2 \\ 0 & 0.9 \end{bmatrix}$$

Find the eigenvectors and associated eigenvalues of  $A$ .