

Mathematics 132, Spring 2018, Take Home Assignment

This will be due on **Friday, June 8, 2018, at 3:10 P.M.**, which is the beginning of the second examination. You may discuss problems with others, but it is expected that the completed assignment will be your own work.

You must show the work or reasons supporting your answers.

1. Show that the 3×3 matrix

$$\begin{pmatrix} 2 & a & b \\ 0 & 1 & c \\ 0 & 0 & 2 \end{pmatrix}$$

has a basis of eigenvectors if and only if $b = -ac$.

2. Give an example of a 3×3 matrix A such that A is in Jordan form but A^2 is not.
3. Let A be the 2×2 matrix

$$\begin{pmatrix} 1 & -1 \\ 3 & 5 \end{pmatrix}.$$

Find a basis of (real) eigenvectors for A , say $\{v_1, v_2\}$ such that the first coordinate of each vector is positive, and find the cosine of the angle $\angle v_1 v_2$.

4. Determine whether the Spectral Theorem applies to each of the following matrices:

$$\begin{pmatrix} 0 & -1 & 0 \\ 1 & 0 & -1 \\ 0 & 1 & 0 \end{pmatrix} \quad \begin{pmatrix} 1 & 2 & 3i \\ 2 & 4 & 6 \\ 3i & 6 & 9 \end{pmatrix}$$

5. Find the determinant of the following 4×4 matrix:

$$\begin{pmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & -1 & 3 \\ 3 & -4 & 0 & 0 \\ 4 & 3 & 0 & 0 \end{pmatrix}$$