

1. Find the eigenvalues and eigenvectors of each matrix below. Check that $\lambda_1 + \lambda_2 + \lambda_3$ equals the trace and that $\lambda_1\lambda_2\lambda_3$ equals the determinant.

(a) $\begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}$

(b) $\begin{bmatrix} 3 & 4 & 2 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & 0 & 0 & 2 \\ 0 & 0 & 2 & 0 \\ 0 & 2 & 0 & 0 \\ 2 & 0 & 0 & 0 \end{bmatrix}$

(d) A 3×3 matrix of all zeros

(e) A 4×4 identity matrix

2. Problem set §5.1, exercises 1, 3, 4, 7, 11, 20, 25.

3. Diagonalize the following matrices, if you can. If not, explain what went wrong.

(a) $\begin{bmatrix} 1 & 3 \\ 0 & 5 \end{bmatrix}$

(b) $\begin{bmatrix} 3 & 1 \\ 0 & 3 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix}$

(d) $\begin{bmatrix} 5 & 1 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 13 \end{bmatrix}$

(e) A 5×5 diagonal matrix with eigenvalues 1,2,3,4,5.

(f) A 4×4 matrix of all ones.

4. Problem set §5.2, exercises 1, 5, 7, 8, 11, 17, 19, 28.