1. Similar matrices

2. Jordan form

3. Statistics

   Given a set of data $x_1, \cdots, x_n$ in $\mathbb{R}$.

   (a) The average $\bar{x} =$

   (b) The sample variance $\sigma^2 =$

4. PCA

Problems

1. Suppose A, B are 2×2 similar matrices, say $B = PAP^{-1}$. Let A has two different eigenvalues λ_1, λ_2 and the corresponding eigenvectors are u_1, u_2. Write down the eigenvalues and eigenvectors of B.

2. Find the Jordan form of the following matrices

   (a) $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$

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

3. If A is a symmetric matrix. Can A be similar to $\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$? Do not use the fact that symmetric matrices are diagonalizable.