1. Let

\[ A = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix} \quad \text{and} \quad x^{(0)} = \begin{pmatrix} 0 \\ 1 \end{pmatrix} \]

Find the first iteration (find \( \mu_1 \) and \( x^{(1)} \)) obtained by the Power or Inverse Power methods, with or without the correct shift

(a) to obtain the largest eigenvalue in absolute value

(b) to obtain the smallest eigenvalue in absolute value

(c) to obtain the closest eigenvalue to the point \( c = 1 \).
2. Let
\[ \begin{align*} 
  v^1 &= \begin{pmatrix} 1/\sqrt{2} \\ 0 \\ -1/\sqrt{2} \end{pmatrix} \\
  v^2 &= \begin{pmatrix} 0 \\ -1 \\ 0 \end{pmatrix} \\
  v^3 &= \begin{pmatrix} 1/\sqrt{2} \\ 0 \\ 1/\sqrt{2} \end{pmatrix} 
\end{align*} \]
and \[ x = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix} \]

(a) Are the vectors \{v^1, v^2, v^3\} a set of orthonormal nonzero vectors in \( \mathbb{R}^3 \)? Why?

(b) Determine the values of \( c_1, c_2, c_3 \) if \[ x = \sum_{i=k}^{3} c_k v^k \]

3. Define. The set of vectors \( \{v_1, v_2, \cdots, v_n\} \) is linearly independent if ...