## Numerical Methods (CS 357) <br> Worksheet

## Problem 1. Problems with power iteration

Name a source of problems with normalized power iteration.
(This question acts as a survey. Answers to this question are not checked for correctness-all answers are marked as correct.)

## Problem 2. Inverse Iteration with Shift

Consider the matrix

$$
A=\left[\begin{array}{lll}
3 & 5 & 7 \\
0 & 2 & 4 \\
0 & 0 & 1
\end{array}\right]
$$

Which eigenvalue belongs to the eigenvector to which inverse iteration with shift 17 converges?

## Problem 3. Schur form

Which of the following is a matrix in Schur form?
(A)

$$
\frac{1}{\sqrt{2}}\left[\begin{array}{cc}
1 & 1 \\
1 & -1
\end{array}\right]\left[\begin{array}{ll}
1 & 2 \\
3 & 4
\end{array}\right] \frac{1}{\sqrt{2}}\left[\begin{array}{cc}
1 & 1 \\
1 & -1
\end{array}\right]
$$

(B)

$$
\frac{1}{\sqrt{2}}\left[\begin{array}{ll}
-1 & -1 \\
-1 & -1
\end{array}\right]\left[\begin{array}{ll}
1 & 2 \\
3 & 4
\end{array}\right] \frac{1}{\sqrt{2}}\left[\begin{array}{cc}
1 & 1 \\
1 & -1
\end{array}\right]
$$

(C)

$$
\left[\begin{array}{cc}
1 & 1 \\
1 & -1
\end{array}\right]\left[\begin{array}{ll}
1 & 2 \\
0 & 4
\end{array}\right] \frac{1}{\sqrt{2}}\left[\begin{array}{cc}
1 & 1 \\
-1 & -1
\end{array}\right]
$$

(D)

$$
\frac{1}{\sqrt{2}}\left[\begin{array}{cc}
1 & 1 \\
1 & -1
\end{array}\right]\left[\begin{array}{ll}
1 & 2 \\
0 & 4
\end{array}\right] \frac{1}{\sqrt{2}}\left[\begin{array}{cc}
1 & 1 \\
1 & -1
\end{array}\right]
$$

## Problem 4. Rayleigh quotient

Compute the Rayleigh quotient for the matrix

$$
A=\left[\begin{array}{ll}
2 & 4 \\
2 & 2
\end{array}\right]
$$

with vector $x=\left[\begin{array}{l}1 \\ 1\end{array}\right]$.

