Writing problems

Problem 1: Problem 2, page 428
Problem 2: Problem 5 (a), page 429
Problem 3: Problem 6, 7, 8, 9 page 429
Problem 4: Problem 11, 13, page 430
Problem 5: 1) Find the spectral radius for matrices:
\[
\begin{pmatrix}
2 & -1 \\
-1 & 2
\end{pmatrix}
\begin{pmatrix}
2 & 1 & 1 \\
2 & 3 & 2 \\
1 & 1 & 2
\end{pmatrix}
\]

2) Which of the above matrices are convergent?
3) Find the $\| \cdot \|_2$ norm for the above matrices.

Problem 6: Find the first two iterations of the Jacobi, Gauss-Seidel, SOR method (using $\omega = 1.2$) for the following linear systems:
\[
\begin{align*}
3x_1 & - x_2 + x_3 = 1 \\
3x_1 & + 6x_2 + 2x_3 = 0 \\
3x_1 & + 3x_2 + 7x_3 = 4
\end{align*}
\]

Problem 7: Show that if $A$ is symmetric, then $\| A \|_2 = \rho(A)$.

Problem 8: Problem 11, 12, page 453.

Programming problems

Problem 9: Using the Jacobi, Gauss-Seidel, and the SOR($\omega = 1.4$) iterative methods, write and run code to solve the following linear system $Ax = b$ to four decimal places of accuracy
\[
A = \begin{bmatrix}
7 & 3 & -1 & 2 \\
3 & 8 & 1 & -4 \\
-1 & 1 & 4 & -1 \\
2 & -4 & -1 & 6
\end{bmatrix}
\quad b = \begin{bmatrix}
-1 \\
0 \\
-3 \\
1
\end{bmatrix}
\]

Compare the number of iterations in each case (the exact solution is $x = (-1, 1, -1, 1)^T$).