Warning: This is a past exam. You should not assume that if a certain topic does not appear here it will not appear on our exam.

**Problem 1.** Determine the values of the parameter $s$ for which the system has a unique solution. Then use Cramer’s rule to find the unique solution of the system:

\[
\begin{align*}
sx_1 + x_2 &= 3 \\
4x_1 + sx_2 &= 2
\end{align*}
\]

**Problem 2.** Determine if the set $W$ is a subspace of $\mathbb{R}^2$. Justify your answer.

\[
W = \left\{ \begin{bmatrix} x \\ y \end{bmatrix} \in \mathbb{R}^2 : \ xy = 0 \right\}
\]
Problem 3. Matrix $A$ is given below:

$$
A = \begin{bmatrix}
2 & -4 & 2 & 4 \\
2 & -6 & -3 & 1 \\
-3 & 8 & 2 & -3 \\
\end{bmatrix}
$$

Find a basis for the column space of $A$. 
Problem 4. Find all the eigenvalues and corresponding eigenvectors of

$$A = \begin{bmatrix} 0 & 3 \\ 1 & 2 \end{bmatrix}$$