Question 1. *(4 marks)* Solve for A, if possible.

$$\begin{bmatrix} 3 & 1 \\ 1 & -1 \end{bmatrix} A - A \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 9 & -21 \\ -23 & -7 \end{bmatrix}$$

Question 2. *(4 marks)* A matrix B is said to be a *square root* of a matrix A if $BB = A$. Find all square roots of $\begin{bmatrix} 5 & 0 \\ 0 & 9 \end{bmatrix}$.

Question 3. *(4 marks)* Prove: That the trace is a linear operator. That is, if A and B are $n \times n$ matrices and α, β are scalars then $\text{trace}(\alpha A + \beta B) = \alpha \, \text{trace}(A) + \beta \, \text{trace}(B)$.