

Question 1. (5 marks) Solve for A , if possible.

$$3A^T - A = \begin{bmatrix} 2 & 0 \\ 8 & 6 \end{bmatrix}$$

Question 2. Determine whether the following statements are true or false for any $n \times n$ matrices A and B . If the statement is false provide a counterexample. If the statement is true provide a proof of the statement.

1. (3 marks) If $A^2 = 0$ then $A = 0$.
2. (3 marks) A square matrix A is *idempotent* if $A^2 = A$. If A and B are idempotent and are commutative then AB is idempotent.
3. (3 marks) If A is any matrix, then $\text{tr}(A^T A) \geq 0$.