Question 1. *(2 marks)* A matrix B is said to be a square root of a matrix A if $BB = A$. Find two square roots of $A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$

Question 2. Determine whether the following statements are true or false. If the statement is false provide a counterexample. If the statement is true provide a proof of the statement.

a. *(3 marks)* If A is a square matrix matrix, then $\text{tr}(A + A^T) = 2\text{tr}(A)$.

b. *(3 marks)* If A and B are square matrices of the same order, then $\text{tr}(AB) = \text{tr}(A)\text{tr}(B)$.

c. *(3 marks)* If B has a column of zeros, then so does AB if this product is defined.

d. *(3 marks)* If $AB + BA$ is defined, then A and B are square matrices of the same size.