Determine $A$, a square matrix, so that $A^2 = B$. We will begin by summarizing properties of the determinant, namely that it is a scalar, is preserved under similarity, and has a sign-changing property when a row or column is interchanged. We then consider the determinant of a product and use this to derive rules for computing the determinant of a lower triangular matrix. The determinant of a matrix is a mapping from the space of $n \times n$ matrices to the space of scalar values 1.

**Theorem 3:** If $A$ is an $n \times n$ matrix, then

1. $det(A^T) = (det(A))^n$.
2. If $n$ is odd, then $det(A)$ is a scalar.
3. If $A$ is a lower triangular matrix, then $det(A) = a_{11}a_{22}\cdots a_{nn}$.

Proof:

1. By definition, $det(A^T) = det(A)$.
2. By definition, $det(A) = a_{11}a_{22}\cdots a_{nn}$.
3. By definition, $det(A) = a_{11}a_{22}\cdots a_{nn}$.