

True or False

1. The equation $\det(A) = \det(-A)$ holds for all 6×6 matrices.
2. There is a 2×2 matrix such that $A^2 = -I_2$. What is A is a 2×2 matrix?
3. If the diagonal entries of an $n \times n$ matrix A are even integers and all of the other entries are odd integers, then A must be an invertible matrix. What if the diagonal elements are odd and the remaining entries are even?
4. Any square matrix can be written as the sum of a symmetric and a skew-symmetric matrix.
5. If A is similar to B and A is orthogonal, then B must also be orthogonal.
6. If V is a subspace of \mathbb{R}^n and \mathbf{x} is a vector in \mathbb{R}^n , then the inequality $\mathbf{x} \cdot \text{proj}_V \mathbf{x} \geq 0$ must hold.