Equivalent Conditions for a Nonsingular Matrix

If A is an $n \times n$ matrix, then the statements below are equivalent.

(1) A is invertible.

(2) $Ax = b$ has a unique solution for every $n \times 1$ column matrix b.

(3) $Ax = 0$ has only the trivial solution.

(4) A is row-equivalent to I_n.

(5) A can be written as the product of elementary matrices.

(6) $det(A) \neq 0$