

Name.....

Number.....

Section

(Q1) [60 points] Fill the blanks with true (T) or false (F).

- [] (1) If E an elementary matrix of type II, then it is both nonsingular and symmetric.
- [] (2) If A and B are $n \times n$ symmetric matrices, then the matrix $AB + BA$ is also symmetric.
- [] (3) If A is an $n \times n$ singular matrix, then the system $Ax = b$ has infinitely many solutions.
- [] (4) If E is an elementary matrix of type III, then $E^{-1} = E$.
- [] (5) If A and B are symmetric matrices, then AB is also symmetric.
- [] (6) If $A^2 = I$, then $A^{-1} = A$.
- [] (7) The product of two elementary matrices is an elementary matrix.
- [] (8) Any $m \times n$ linear system $Ax = 0$ has a nontrivial solution if $m > n$.
- [] (9) If A is a nonsingular matrix, then A^T is nonsingular.
- [] (10) The sum of two triangular matrices is a triangular matrix.
- [] (11) If E is an elementary matrix, then E^T is also elementary of the same type.
- [] (12) If A is a singular matrix, then the system $Ax = 0$ has infinite number of solutions.
- [] (13) If A is a singular matrix and U is the RREF of A , then U must have at least one zero row.
- [] (14) Any invertible matrix is a product of elementary matrices.
- [] (15) If A is symmetric and nonsingular, then A^{-1} is symmetric.
- [] (16) All 5×5 nonsingular matrices are row equivalent.
- [] (17) If A is a square matrix and the system $Ax = 0$ has a nontrivial solution, then A is nonsingular.
- [] (18) If A is an $n \times n$ nonsingular matrix, then A^3 is nonsingular.
- [] (19) If A is a nonsingular matrix and α a nonzero scalar, then $(\alpha A)^{-1} = \alpha A^{-1}$.
- [] (20) If A and B are $n \times n$ diagonal matrices, then $AB = BA$.
- [] (21) If A is a 3×3 matrix with $a_1 = a_2 = a_3$, then $Ax = 0$ has infinitely many solutions.
- [] (22) If A and B are nonsingular $n \times n$ matrices, then $A + B$ is also nonsingular.
- [] (23) If A is both symmetric and skew-symmetric, then A is a zero matrix.
- [] (24) If the system $Ax = b$ is consistent, then b is a linear combination of the columns of A .
- [] (25) A square matrix A is nonsingular iff its RREF is the identity matrix.
- [] (26) If b can be written as a linear combination of the columns of a singular matrix A , then the system $Ax = b$ has infinitely many solutions.
- [] (27) If A, B, C are $n \times n$ nonsingular matrices, then $A^2 - B^2 = (A - B)(A + B)$.
- [] (28) If b is any column of the matrix A , then the system $Ax = b$ is consistent.
- [] (29) The sum of a symmetric and skew-symmetric matrices is skew-symmetric.

- [] (30) Let A be nonsingular. If A is skew-symmetric, then A^{-1} is skew-symmetric.
- [] (31) Let A be nonsingular. If A is upper triangular, then A^{-1} is upper triangular.
- [] (32) Let A be nonsingular. If A is diagonal, then A^{-1} is diagonal.
- [] (33) If A is a 3×3 matrix and $(2, 3, -1)^T$ is a solution to $Ax = 0$, then $(-6, -9, 3)^T$ is also a solution.
- [] (34) If the square system $Ax = b$ has more than one solution, then A is singular.
- [] (35) If A is a 4×4 nonsingular matrix, then AA^T is both symmetric and nonsingular.
- [] (36) If A is a 4×4 matrix and $Ax = 0$ has only the zero solution, then A is row equivalent to I .
- [] (37) If A is a nonsingular matrix, then $(A^T)^T = (A^{-1})^{-1}$.
- [] (38) Every linear system with eight unknowns in three equations is consistent.
- [] (39) If the augmented matrix of a 3×2 system is row equivalent to I , then this system is inconsistent.
- [] (40) The identity matrix is row equivalent to any elementary matrix of the same size.