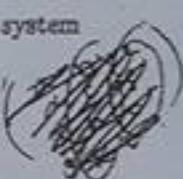
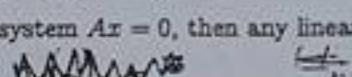
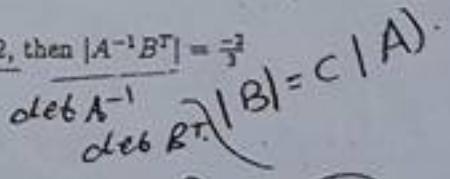
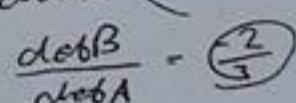


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Instructor: Dr. K. Altakhman

Question 1 (39 points). Mark each of the following by True or False

- (1) (.T.) An $n \times n$ -matrix A is nonsingular if and only if A is a product of elementary matrices.
- (2) (.F.) Any two $n \times n$ -singular matrices are row equivalent.
- (3) (.T.) If A is a singular matrix and U is the row echelon form of A , then $\det(U) = 0$.
- (4) (.T.) If A is a 3×3 -matrix and the system $Ax = \begin{pmatrix} 5 \\ 1 \\ 3 \end{pmatrix}$ has a unique solution, then the system $Ax = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$ has only the zero solution. 
- (5) (.T.) If an $n \times n$ -matrix A is nonsingular, then Cramer's rule can be used to solve the system $Ax = b$.
- (6) (.T.) Let A be a 4×3 -matrix with $a_2 = a_3$. If $b = a_1 + a_2 + a_3$, where a_j is the j th column of A , then the system $Ax = b$ will have infinitely many solutions.
- (7) (.T.) If y, z are solutions to the system $Ax = 0$, then any linear combination of y, z is also a solution to $Ax = 0$. 
- (8) (.T.) If A is a singular and B a nonsingular $n \times n$ -matrices, then AB is singular.
- (9) (.F.) If a matrix B is obtained from A by multiplying a row of A by a real number c , then $|A| = c|B|$.
- (10) (.T.) If A, B are $n \times n$ -matrices, $|A| = 3$ and $|B| = -2$, then $|A^{-1}B^T| = \frac{-2}{3}$.
- (11) (.T.) If A is a singular matrix, then $\text{adj}(A) = 0$. 
- (12) (.T.) $S = \left\{ \begin{pmatrix} a \\ b \\ 0 \end{pmatrix} : a, b \in \mathbb{R} \right\}$ is a subspace of \mathbb{R}^3 . 
- (13) (.F.) If A is row equivalent to B , then $\det(A) = \det(B)$.
- (14) (.F.) If A is a nonsingular $n \times n$ -matrix and c is a nonzero real number, then $(cA)^{-1} = \left(\frac{1}{c}\right)^n A^{-1}$.
- (15) (.F.) If A is a singular $n \times n$ -matrix, $b \in \mathbb{R}^n$, then the system $Ax = b$ has infinitely many solutions.
- (16) (.F.) If A, B are 4×4 -matrices and AB is the zero matrix, then $\det(A) = 0$.

~~AB = 0~~

$$\det(AB) = \frac{\det(A)}{0} \cdot \frac{\det(B)}{0} \quad \cancel{\text{33}}$$