Homework

1. Show that B is the inverse of A. $A=\begin{pmatrix}2 & 1\\ 5 & 3\end{pmatrix}$; $B=\begin{pmatrix}3 & -1\\ -5 & 2\end{pmatrix}$

2. Find the inverse of the matrix $\begin{pmatrix}2 & 0\\ 0 & 3\end{pmatrix}$

3. Find the inverse of the matrix $\begin{pmatrix}1 & 2\\ 3 & 7\end{pmatrix}$

4. Find the inverse of the matrix $\begin{pmatrix}-1 & 1\\ 3 & -3\end{pmatrix}$

5. Find the inverse of the matrix $\begin{pmatrix}1 & 1 & 1\\ 3 & 5 & 4\\ 3 & 6 & 5\end{pmatrix}$

6. Find the inverse of the matrix $\begin{pmatrix}-4 & -6\\ 2 & 3\end{pmatrix}$

7. Find the inverse of the matrix $A=\begin{pmatrix}\sin\theta & \cos\theta\\ -\cos\theta & \sin\theta\end{pmatrix}$

8. Prove that is A is an invertible matrix, then $\left(A^T\right)^{-1}=\left(A^{-1}\right)^T$

9. Prove if C is an invertible matrix such that $CA=CB$, then $A=B$

10. Prove that if $A^2=A$, then $I-2A=(I-2A)^{-1}$

11. Prove that the inverse of a symmetric nonsingular matrix is symmetric.

12. Prove that if A, B, and C are square symmetric matrices and $ABC=I$, then B is an invertible and $B^{-1}=CA$.

13. Let $A=\begin{pmatrix}1 & 2\\ -2 & 1\end{pmatrix}$

a) Show that $A^2-2A+5I=0$

b) Show that $A^2=\frac{1}{5}(2I-A)$

c) Show that for any square matrix satisfying $A^2-2A+5I=0$, the inverse of A is $A^2=\frac{1}{5}(2I-A)$

Find an LU-factorization of the matrix

14. $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$

15. $\begin{pmatrix} 3 & 0 & 1 \\ 6 & 1 & 1 \\ -3 & 1 & 0 \end{pmatrix}$

16. Use A^{-1} to decode the cryptogram

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 5 \end{pmatrix}$$

11 21 64 112 25 50 29 53 23 46 40 75 55 92

17. Use A^{-1} to decode the cryptogram

$$A = \begin{pmatrix} 1 & 2 & 2 \\ 3 & 7 & 9 \\ -1 & -4 & -7 \end{pmatrix}$$

13 19 10 −1 −33 −77 3 −2 −14 4 1 −9 −5 −25 −47 4 1 −9