

Homework Assignment #2

(NYC Summer 2006)

Show all your work!

1. Let $A = \begin{bmatrix} 2 & -3 & 1 & 0 & 2 & 4 \\ 3 & -3 & 0 & -4 & 1 & 1 \\ -1 & 1 & 5 & 3 & 3 & -2 \\ 0 & 4 & -2 & 1 & 0 & 3 \\ 4 & 5 & -3 & 1 & 1 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -2 & 8 \\ 0 & 3 & 5 \\ 9 & 1 & -1 \\ -4 & 3 & 2 \\ 0 & -7 & 6 \\ 3 & 2 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 5 & -2 \\ 0 & 0 & 0 \\ -5 & -3 & 6 \\ 2 & 3 & 5 \\ 7 & -3 & 6 \\ -6 & 8 & 1 \\ 1 & 9 & 9 \\ 4 & 1 & 0 \end{bmatrix}$.

- (a) Let $D = AB$; find $(D)_{42}$
- (b) Let $E = ABC^T$; find $(E)_{37}$
- (c) Find $\text{tr}(AA^T)$

Note: In each of these cases you should be able to find the desired value without calculating the whole product!

2. A matrix B is said to be a square root of a matrix A if $BB = A$. Find a square root of $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$.

3. Find the inverse of $\begin{bmatrix} 1 & -2 & 1 \\ 2 & -5 & -1 \\ 0 & -1 & 2 \end{bmatrix}$.

4. Let A be a square matrix such that $A^3 = 0$. Prove that $(I - A)^{-1} = I + A + A^2$.