

Math 122-002 201730
Practice Assignment # 5

*Please remember that the assignment consists of only a sample of the kind of questions you are supposed to be able to do. It is **not** a safe practice to just do the assignment, and that is why there is a list of “suggested practice problems”.*

For questions 1 and 2, read “Block Multiplication” in pages 64 and 65 of the textbook.

1. Compute AB using the indicated block partitioning

$$A = \left[\begin{array}{cc|cc} 2 & -1 & 3 & 1 \\ 1 & 0 & 1 & 2 \\ \hline 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array} \right], \quad B = \left[\begin{array}{cc|c} 1 & 2 & 0 \\ -1 & 0 & 0 \\ \hline 0 & 5 & 1 \\ 1 & -1 & 0 \end{array} \right].$$

2. Assuming all blocks are $k \times k$ (in particular $I = I_{k \times k}$), compute:

(a) $\begin{bmatrix} I & X \\ 0 & I \end{bmatrix}^2$

(c) $[I \ X] [I \ X]^T$

(d) $[I \ X]^T [I \ X]$

(b) $\begin{bmatrix} I & X \\ -Y & I \end{bmatrix} \begin{bmatrix} I & 0 \\ Y & I \end{bmatrix}$

(e) $\begin{bmatrix} I & X \\ 0 & I \end{bmatrix} \begin{bmatrix} I & Y \\ 0 & I \end{bmatrix}$.

You can use the fact that if $A = \begin{bmatrix} X & Y \\ Z & W \end{bmatrix}$ is a block matrix, then

$$A^T = \begin{bmatrix} A^T & Z^T \\ Y^T & W^T \end{bmatrix}.$$

3. Solve the system by finding the inverse of a matrix.

(a) $\begin{cases} 3x - 4y = 8 \\ -x + y = 9 \end{cases}$

(b) $\begin{cases} x + y = 2 \\ x - y = 3 \end{cases}$

4. Let

$$A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & -1 \\ 1 & 0 & 0 \end{bmatrix}.$$

Calculate A^2 , and use the result to find A^{-1} .