-1- (Matrix Multiplication.)

$$\begin{array}{cc} & \begin{bmatrix}1&1\\-1&2\\1&3\end{bmatrix} \\ \begin{bmatrix}1&-1&1\\1&2&3\end{bmatrix} & \begin{bmatrix}3&2\\2&14\end{bmatrix} \end{array} = AA^T \quad \text{and} \quad \begin{array}{cc} & \begin{bmatrix}1&-1&1\\1&2&3\end{bmatrix} \\ \begin{bmatrix}1&1\\-1&2\\1&3\end{bmatrix} & \begin{bmatrix}2&1&4\\1&5&5\\4&5&10\end{bmatrix} \end{array} = A^TA$$

-2- (Rank.)

$$AB = \begin{bmatrix}1\\3\end{bmatrix}\begin{bmatrix}2&1\end{bmatrix} + \begin{bmatrix}2\\4\end{bmatrix}\begin{bmatrix}1&2\end{bmatrix} = \begin{bmatrix}2&1\\6&3\end{bmatrix} + \begin{bmatrix}2&4\\4&8\end{bmatrix} = \begin{bmatrix}4&5\\10&11\end{bmatrix}.$$

$$\begin{bmatrix}4&5\\10&11\end{bmatrix} = \begin{bmatrix}4&0\\10&0\end{bmatrix} + \begin{bmatrix}0&5\\0&11\end{bmatrix} = \begin{bmatrix}4&5\\0&0\end{bmatrix} + \begin{bmatrix}0&0\\10&11\end{bmatrix}.$$

-3- (LU-factorization.)

$$\begin{array}{ccc} & \begin{bmatrix}1&2\\0&-2\end{bmatrix} & = U \\ L = \begin{bmatrix}1&0\\3&1\end{bmatrix} & \begin{bmatrix}1&2\\3&4\end{bmatrix} & = A \end{array}$$

-4- (Inverse Matrix.) Compute the inverse of

$$A = \begin{bmatrix}1&2\\3&4\end{bmatrix}$$

$$\begin{array}{ccc} & \begin{bmatrix}-2&1\\3/2&-1/2\end{bmatrix} & = A^{-1} \\ A = \begin{bmatrix}1&2\\3&4\end{bmatrix} & \begin{bmatrix}1&0\\0&1\end{bmatrix} & = I \end{array}$$

-5- (Block Matrices.)

$$A^{-1} = \begin{bmatrix}A_{11}^{-1} & -A_{11}^{-1}A_{12}A_{22}^{-1} \\ \mathbf{0} & A_{22}^{-1}\end{bmatrix}$$

-6- (True or False.) For each of the following statements indicate whether they are true (T) or false (F). Assume A is an $m \times n$ matrix. You do not need to give reasons for your answer.

1. F 2. T 3. T 4. F 5. T 6. F 7. T 8. T 9. T 10. T

F T T F T F T T T T