Worksheet 3: partitioned matrices

Example 0.20. Let

$$\mathbf{A} = \left[\begin{array}{ccc|cc} 1 & 2 & 3 & 0 & 0 \\ 4 & 5 & 6 & 0 & 0 \\ 7 & 8 & 9 & 0 & 0 \end{array}\right], \quad \mathbf{B} = \left[\begin{array}{cc} 1 & -1 \\ 1 & -1 \\ 1 & -1 \\ \hline 1 & -1 \\ 1 & -1 \end{array}\right]$$

Find **AB** using two ways: (a) direct multiplication (b) block multiplication.

Answer (we have already worked out this last time).

$$\mathbf{AB} = \begin{bmatrix} 6 & -6 \\ 15 & -15 \\ 24 & -24 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \cdot \begin{bmatrix} 1 & -1 \\ 1 & -1 \\ 1 & -1 \end{bmatrix} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \cdot \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix}$$

Example 0.21. Show that

$$\begin{bmatrix} U_1 & U_2 \end{bmatrix} \begin{bmatrix} \Sigma & O \\ O & O \end{bmatrix} \begin{bmatrix} V_1 & V_2 \end{bmatrix}^T = U_1 \, \Sigma \, V_1^T$$

(assuming all submatrices are compatible with each other)

Example 0.22. Find the product of $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 1 & 0 \\ 1 & 0 \\ 1 & 0 \end{bmatrix}$ by using three different ways: (a) Columnwise multiplication (b) Rowwise multiplication and (c) Column-row multiplication

Example 0.23. Find the inverse of

$$\left[\begin{array}{cc|c} 1 & 2 & \\ 1 & 3 & \\ \hline & & 4 \end{array}\right]$$

Example 0.24. Find the inverse of

$$\left[\begin{array}{cc|c} 1 & 2 & 1 \\ 1 & 3 & 1 \\ \hline & & 4 \end{array}\right]$$