

**Assignment for Section 2.7: Transposes and permutations**

(1) Let

$$A = \begin{bmatrix} 1 & 0 \\ 9 & 3 \end{bmatrix}.$$

Find  $A^\top$  and  $A^{-1}$  and  $(A^\top)^{-1}$  and  $(A^{-1})^\top$ .

(2) Let

$$A = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}.$$

Verify that  $(AB)^\top$  equals  $B^\top A^\top$  but those are different from  $A^\top B^\top$ .

(3) Factor the symmetric matrix  $S = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$  into  $S = LDL^\top$  with the diagonal pivot matrix  $D$ .

(4) Let

$$A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 2 & 3 & 4 \end{bmatrix}.$$

Find the factorization  $PA = LU$ .