

APPLIED LINEAR ALGEBRA 2018

(1) Find the inverse of  $B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 4 & 1 & 0 & 0 \\ 3 & 4 & 1 & 0 \\ 2 & 3 & 4 & 1 \end{bmatrix}$ .

(2) Let  $A = \begin{bmatrix} 1 & 4 & 1 & 1 & 1 \\ 1 & 4 & 2 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix}$ .

(a) Find a basis for the column space of  $A$ .

(b) Find a basis for the orthogonal complement of the column space of  $A$ .

(3) Let  $A = (a_{ij})$  be the  $n$  by  $n$  matrix defined by

$$a_{ij} = \begin{cases} 1 & \text{if } i - j = 1, \\ 0 & \text{otherwise.} \end{cases}$$

Find the sum of all entries of the matrix  $\sum_{k=1}^{2n} A^k$ .