

Exercise 1

December 17, 2020

1. Compute the following matrix products, if possible:

$$(a) \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$$

$$(b) \begin{bmatrix} 1 & 2 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

$$(c) \begin{bmatrix} 1 & 2 \\ 4 & 5 \\ 7 & 8 \end{bmatrix} \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$

$$(d) \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

$$(e) \begin{bmatrix} 1 & 2 & 1 & 2 \\ 4 & 1 & -1 & -4 \end{bmatrix} \begin{bmatrix} 0 & 3 \\ 1 & -1 \\ 2 & 1 \\ 5 & 2 \end{bmatrix}$$

2. Using Gaussian elimination, find the set S of all solutions in x of the following inhomogeneous linear systems $Ax = b$ where A and b are defined as follows:

$$(a) A = \begin{bmatrix} 1 & 1 & -1 \\ 0 & 2 & 1 \\ 1 & 1 & -4 \end{bmatrix}, b = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$$

$$(b) \quad A = \begin{bmatrix} 1 & 1 & -1 & -1 \\ 2 & 5 & -7 & -5 \\ 2 & -1 & 1 & 3 \\ 5 & 2 & -4 & 2 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ -2 \\ 4 \\ 6 \end{bmatrix}$$

$$(c) \quad A = \begin{bmatrix} 2 & 1 & 1 \\ -1 & 2 & 1 \end{bmatrix}, \quad b = \begin{bmatrix} 3 \\ 6 \end{bmatrix}$$

$$(d) \quad A = \begin{bmatrix} 2 & 1 \\ -1 & 2 \\ 1 & 1 \end{bmatrix}, \quad b = \begin{bmatrix} 3 \\ 6 \\ -1 \end{bmatrix}$$

3. Determine the inverses of the following matrices if possible:

$$(a) \quad A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 6 \end{bmatrix},$$

$$(b) \quad A = \begin{bmatrix} 4 & 1 \\ 3 & 1 \end{bmatrix}$$