Homework #3(Week 4) – MSCA 32010

John Navarro

1. The missing components are 12,3,1.

$$\begin{matrix} x \\ y = \\ z \end{matrix} \begin{matrix} 12 \\ 0 \\ 0 \end{matrix} + y \begin{matrix} 3 \\ 1 \\ 0 \end{matrix} + z \begin{matrix} 1 \\ 0 \\ 1 \end{matrix}$$

2. N(C) = N(A) ∩ N(B)

3a. $A = \begin{matrix} 1 & 5 & 7 & 9 \\ 0 & 4 & 1 & 7 \\ 2 & -2 & 11 & -3 \end{matrix}$ The reduced row form of this matrix is

$$R = \begin{matrix} 1 & 0 & {}^{23}/_{4} & {}^{1}/_{4} \\ 0 & 1 & {}^{1}/_{4} & {}^{7}/_{4} \\ 0 & 0 & 0 & 0 \end{matrix}$$

3b. Since it has 2 pivots, this matrix is rank 2.

3c. $S_1 = \begin{matrix} {}^{-23}/_{4} \\ {}^{-1}/_{4} \\ 1 \\ 0 \end{matrix}$ $S_2 = \begin{matrix} {}^{-1}/_{4} \\ {}^{-7}/_{4} \\ 0 \\ 1 \end{matrix}$

Bonus

Since B has a rank 1, then we can multiply it by the Identity matrix to so A_1B has rank 1

$$A_1B * B = A_1B \quad A_1 * \begin{matrix} 1 & 1 \\ 1 & 1 \end{matrix} = \begin{matrix} 1 & 1 \\ 1 & 1 \end{matrix}$$

Therefore, $A_1 = \begin{matrix} 1 & 0 \\ 0 & 1 \end{matrix}$

A_2 will be the zero vector, since A_2B is a matrix with rank 0, it has no pivots

$$A_2 * B = A_2B \quad A_2 * \begin{matrix} 1 & 1 \\ 1 & 1 \end{matrix} = \begin{matrix} 0 & 0 \\ 0 & 0 \end{matrix}$$

Therefore, $A_2 = \begin{matrix} 0 & 0 \\ 0 & 0 \end{matrix}$