

**Problem 1.** Find a basis for the column space of the following matrix:

$$\begin{pmatrix} 1 & 0 & 1 & 2 \\ 0 & 0 & 6 & 9 \\ 4 & 0 & 4 & 8 \\ 2 & 1 & 5 & 6 \\ 0 & 0 & 2 & 3 \end{pmatrix}$$