1. Find a nonzero $2 \times 2$ matrix $B$ such that

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

2. Show that the following set $W$ is a subspace of $\mathbb{R}^3$,

$$W = \left\{ \begin{bmatrix} x \\ y \\ z \end{bmatrix} : x - y + 3y = 0 \right\}.$$ 

3. Find bases for $\ker(A)$ and $\text{im}(A)$ where

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