$$A = \begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 2 & 2 & 0 \end{bmatrix}$$

a) How does the nullspace of $A$ relate to solutions of $A\vec{x} = \vec{0}$

b) What is the nullspace of $A$?

c) What is a basis for the nullspace of $A$?

d) What is the geometry of the nullspace of $A$?

e) How does the column space of $A$ relate to the span of the columns of $A$?

f) What is a basis for the column space of $A$?

g) What is the column space of $A$?

h) What is the geometry of the column space of $A$?

i) What is an algebraic equation that represents which vectors are in the column space of $A$?

Repeat for $\begin{bmatrix} 1 & 4 \\ 2 & 8 \\ 3 & 12 \end{bmatrix}$ and $\begin{bmatrix} 4 & 4 \\ 2 & 2 \\ -1 & -2 \end{bmatrix}$