1. A matrix is called *symmetric* if for each of its entries $a_{i,j}$ we have $a_{i,j} = a_{j,i}$. For example, the matrix
$$\begin{pmatrix} 2 & 4 & -1 \\ 4 & 0 & 3 \\ -1 & 3 & -2 \end{pmatrix}$$
is symmetric.
   (a) What is the dimension of the subspace of symmetric matrices inside $\mathcal{M}_{3\times 3}$?
   (b) Give a basis for this subspace, and prove that it is a basis.

2. Consider the space
$$V = \left\{ \begin{pmatrix} a+b \\ a+c \end{pmatrix} : a, b, c \in \mathbb{R} \right\}.$$
This is a subset of $\mathbb{R}^2$.
   (a) Prove that this is a vector space. Please use the subspace property to make it quick.
   (b) What is the dimension of this space?
   (c) Give a basis for this space, and prove that it is a basis.