1. a. Find a vector $\mathbf{a}_3$ that is linearly independent to the vectors

$$\mathbf{a}_1 = \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} \quad \text{and}, \quad \mathbf{a}_2 = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$$

b. Find a new vector $\mathbf{a}_4$ that is linearly independent of $\mathbf{a}_3$.

c. Find a new vector $\mathbf{a}_5$ that is linearly independent of $\mathbf{a}_3$ and $\mathbf{a}_4$.

2. a. Are the columns of

$$\begin{pmatrix} 2 & 4 & 14 & 0 \\ 3 & 10 & 19 & 5 \\ -2 & -4 & -11 & 0 \end{pmatrix}$$

linearly independent? If not, give a dependence relation among the columns.

b. Do the columns span all of $\mathbb{R}^3$?

3. a. Draw three linearly dependent vectors in $\mathbb{R}^2$. 
b. Draw four linearly dependent vectors in $\mathbb{R}^3$.

4. What does it mean for $\{v_1\}$ to be linearly independent?

5. Draw the image of the square under each linear transformation.

\[
\begin{pmatrix}
1 & .5 \\
.5 & 1
\end{pmatrix}
\]
\[
\begin{pmatrix}
0 & 1 \\
1 & 0
\end{pmatrix}
\]
\[
\begin{pmatrix}
-2 & 0 \\
0 & -2
\end{pmatrix}
\]