1. Exercise 6.2.2. (You do not need to sketch anything.)

2. Let \( \vec{a}, \vec{b}, \vec{c} \) be nonzero vectors in \( \mathbb{R}^n \) that are pairwise orthogonal (that is, \( \langle \vec{a}, \vec{b} \rangle = 0 \), \( \langle \vec{b}, \vec{c} \rangle = 0 \), and \( \langle \vec{a}, \vec{c} \rangle = 0 \)). Show that \( \{ \vec{a}, \vec{b}, \vec{c} \} \) are linearly independent.

3. Which of the following matrices are orthogonal?
   (a) \[
   \begin{bmatrix}
   0 & 0 & 1 \\
   -1 & 0 & 0 \\
   0 & -1 & 0 
   \end{bmatrix}
   \]
   (b) \[
   \begin{bmatrix}
   1 & 1 \\
   -1 & 1 
   \end{bmatrix}
   \]
   (c) \[
   \begin{bmatrix}
   1/2 & \sqrt{3}/2 \\
   -\sqrt{3}/2 & 1/2 
   \end{bmatrix}
   \]
   (d) \[
   \begin{bmatrix}
   1/\sqrt{3} & 1/\sqrt{3} & 1/\sqrt{3} \\
   1/\sqrt{3} & 1/\sqrt{3} & 1/\sqrt{3} \\
   1/\sqrt{3} & 1/\sqrt{3} & 1/\sqrt{3} 
   \end{bmatrix}
   \]

4. Prove that an orthogonal matrix can never have 2 as one of its entries. (For example, this implies \[
   \begin{bmatrix}
   2 & 1 \\
   1 & 1 
   \end{bmatrix}
   \] cannot be orthogonal.)