1. #10 §6.2, p. 392: Show that
\[u_1 = \begin{pmatrix} 3 \\ -3 \\ 0 \end{pmatrix}, \quad u_2 = \begin{pmatrix} 2 \\ 2 \\ -1 \end{pmatrix}, \quad u_3 = \begin{pmatrix} 1 \\ 1 \\ 4 \end{pmatrix}\]
are orthogonal. The express \(x = \begin{pmatrix} 5 \\ -3 \\ 1 \end{pmatrix}\) as a linear combination of the \(u\)'s.

2. #32, §6.2, p. 393: Let \(\{v_1, v_2\}\) be an orthogonal set of nonzero vectors, and \(c_1, c_2\) be any nonzero scalers. Show that \(\{c_1v_1, c_2v_2\}\) is also an orthogonal set. Since orthogonality of a set is defined in terms of pairs of vectors, this shows that if the vectors in an orthogonal set is normalized, the new set will still be orthogonal.

3. #10, §6.3, p. 400: Let \(W\) be the subspace spanned by
\[u_1 = \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}, \quad u_2 = \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix}, \quad u_3 = \begin{pmatrix} 0 \\ -1 \\ 1 \end{pmatrix}\]
Write \(y = \begin{pmatrix} 3 \\ 4 \\ 5 \\ 6 \end{pmatrix}\) as a sum of a vector in \(W\) and a vector orthogonal to \(W\)

4. #20, §6.3, p. 401: Let \(u_1 = \begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}\), \(u_2 = \begin{pmatrix} 5 \\ -1 \\ 2 \end{pmatrix}\), and \(u_4 = \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}\). It can be shown that \(u_4\) is not in the subspace \(W\) spanned by \(u_1\) and \(u_2\). Use this fact to construct a nonzero vector \(v\) in \(\mathbb{R}^3\) that is orthogonal to \(u_1\) and \(u_2\).