Additional Exercises: Chapter 4
Linear Algebra and Probability for Computer Science Applications

Problem 1

For each of the following sets of vectors, state whether it is linearly dependent or linearly independent and explain your answer in a sentence. You should refer to theorems in the book when they are relevant. You should be able to do these by inspection, without setting pencil to paper, let alone starting up MATLAB.

A. $\{ \langle 4, 2, 7\rangle,$
$\langle 0, 0, 0\rangle,$
$\langle 6, 2, 1\rangle$
$\}$

B. $\{ \langle 2, 0, 0, 0\rangle,$
$\langle 3, 4, 0, 0\rangle,$
$\langle 1, 0, 1, 0\rangle$
$\}$

C. $\{ \langle 7, 5, 2\rangle,$
$\langle 1, -1, 1\rangle,$
$\langle 3, 0, -2\rangle,$
$\langle 1, 2, 6\rangle$
$\}$

D. $\{ \langle 1, 1, 3\rangle,$
$\langle 1, 7, 2\rangle.$
$\}$

Problem 2

Using MATLAB to help you calculate, apply the Gram-Schmidt orthogonalization algorithm (p. 101) to construct an orthonormal basis for the space $\mathcal{P}$ below and for its orthogonal complement. Show the sequence in which the algorithm adds vectors to the two bases.

$$\begin{aligned}\mathcal{P} = \{ & \langle 1, 2, 3, 4, 5, 6, 7\rangle, \\ & \langle 2, -3, 5, -8, 13, -21, 34\rangle, \\ & \langle 3, 5, 7, 9, -11, -13, -15\rangle, \\ & \langle 1, 0, 4, 0, 2, 0, 8\rangle \\ \}&\end{aligned}$$