NAME: PeopleSoft ID:

MATH 2331 - Linear Algebra - Spring 2018
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Homework 10 - due Thursday 04/26

Instructions:

• For the MATLAB exercises, send the scripts to yushutin@math.uh.edu. For homework n, write “lastname, firstname - homework n” as the subject of your email. Call “lastname_hwn_1” the script generated for exercise 1, “lastname_hwn_2” the script generated for exercise 2 and so on, where lastname is your last name.

Exercises from the book:

- Section 5.3: exercises 4, 18, 21, 27.
- Section 6.1: exercises 1, 4, 6, 8, 14, 16, 17, 20.

MATLAB exercises:
Create a script for the following exercises:

1. Let
   \[ A = \begin{bmatrix}
   0.5 & 0.5 & 0.5 & 0.5 \\
   0.5 & 0.5 & -0.5 & -0.5 \\
   0.5 & -0.5 & 0.5 & -0.5 \\
   0.5 & -0.5 & -0.5 & 0.5
   \end{bmatrix}. \]

   (a) Denote the columns of A by \( a_1, \ldots, a_4 \). Compute the length (i.e., norm) of each column, and compute
   \( a_1 \cdot a_2, a_1 \cdot a_3, a_1 \cdot a_4, a_2 \cdot a_3, a_2 \cdot a_4, a_3 \cdot a_4 \).

   (b) Generate 5 vectors \( u \) with random integer entries between 0 and 9. Compute and compare the lengths of
   \( u \) and \( Au \).

2. Let \( S \) be the standard basis for \( \mathbb{R}^5 \). Let basis \( W \) and vector \( u \):

   \[ W = \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} \right\}, \quad u = \begin{bmatrix} 5 \\ -2 \\ 7 \\ 6 \\ -3 \end{bmatrix}. \]

   Find the coefficients to express \( u \) as a linear combination of the vectors in \( S \) and \( W \). Comment on the results.