Homework 4

Due Wednesday, September 27, 2023

Instructions. *Your work will be collected in class on the due date. We will also have a quiz in class on the due date based on the content from the assignment. See the back of the textbook for solutions and hints for odd-numbered problems.*

Exercise 1. Complete the following exercises from Section 1.7 in the course textbook:

\# 1, 3, 5, 7, 9, 11, 13, 21–30, 37, 46

Exercise 2. Complete the following exercises from Section 1.8 in the course textbook:

\#1, 3, 5, 9, 11, 17, 19, 32, 38, 41

Exercise 3. Complete the following exercises from Section 1.9 in the course textbook:

\#1, 3, 4, 5, 6, 15, 17

Exercise 4. Suppose $T\colon \mathbb{R}^2 \to \mathbb{R}^3$ is a linear transformation such that $T(\mathbf{e}_1) = \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}$ and $T(\mathbf{e}_2) = \begin{bmatrix} -1 \\ -3 \\ 2 \end{bmatrix}$.

(a) Find a formula for $T(\mathbf{x})$, that is, compute $T\left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \right)$.

(b) Find the standard matrix for T.

Exercise 5. Suppose $T\colon \mathbb{R}^3 \to \mathbb{R}^2$ is a linear transformation such that

$$T\left(\begin{bmatrix} 1 \\ -3 \\ 7 \end{bmatrix} \right) = T\left(\begin{bmatrix} 5 \\ 2 \\ 0 \end{bmatrix} \right)$$

Find a nontrivial solution to $T(\mathbf{x}) = \mathbf{0}$.