All of the homework exercises are taken from the course textbook:
*Linear Algebra* (5th Edition) by Friedberg, Insel and Spence.

1. First Week

As the bookstore does not yet have the 5th edition in stock, this week (and this week only) I will write out the homework exercises.

**Exercise 1.2.18:** Let $V = \{(a_1, a_2) \mid a_1, a_2 \in \mathbb{R} \}$. For $(a_1, a_2), (b_1, b_2) \in V$ and $c \in \mathbb{R}$, define

$$(a_1, a_2) + (b_1, b_2) = (a_1 + 2b_1, a_2 + 3b_2)$$

and

$$c(a_1, a_2) = (ca_1, ca_2).$$

Is $V$ a vector space over $\mathbb{R}$ with these operations? Justify your answer.

**Exercise 1.2.19:** Let $V = \{(a_1, a_2) \mid a_1, a_2 \in \mathbb{R} \}$. Define addition of elements of $V$ coordinatewise, and for $(a_1, a_2) \in V$ and $c \in \mathbb{R}$, define

$$c(a_1, a_2) = \begin{cases} 
(0, 0) & \text{if } c = 0; \\
(ca_1, \frac{a_2}{c}) & \text{if } c \neq 0.
\end{cases}$$

Is $V$ a vector space over $\mathbb{R}$ with these operations? Justify your answer.

**Exercise 1.3.8:** Determine whether the following sets are subspaces of $\mathbb{R}^3$ under the usual operations of vector addition and scalar multiplication. Justify your answers.

(a) $W_1 = \{(a_1, a_2, a_3) \in \mathbb{R}^3 \mid a_1 = 3a_2 \text{ and } a_3 = -a_2 \}.$

(f) $W_6 = \{(a_1, a_2, a_3) \in \mathbb{R}^3 \mid 5a_1^2 - 3a_2^2 + 6a_3^2 = 0 \}.$
2. The remainder of the semester

Unless otherwise noted, the numbering of the homework exercises is identical in the 4th and 5th editions of the textbook.

**Week 2:** 1.4.3(f), 1.4.5(h), 1.4.15, 1.6.7

**Week 3:** 1.6.14, 2.1.3, 2.1.4

*In Exercises 2.1.3 and 2.1.4, you are only required to find bases of $N(T)$ and $R(T)$.*

**Week 4:**

- 5th Edition: 2.2.3, 2.2.17
- 4th Edition: 2.2.3, 2.2.16

*Hint: In the second exercise, it is helpful to think about the proof of the Dimension Theorem.*