- Section 7.3: 6, 14, 16, 24, 50.
- Section 7.5: 22, 24.
- Chapter 7 Exercises (p. 382): 1–20.
- Section 8.1: 6, 8, and 10.
- Section 8.2: 4, 6, 18, 22.
- Section 8.3: 6, 12, 14.
- Chapter 8 exercises (p. 413): 1–16.

Problem 1. Find the eigenvalues and eigenvectors of

$$A = \begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$$

where $i = \sqrt{-1}$.

Problem 2. Suppose we are sitting at $(0, 0, 0)$ on the landscape

$$z = 3x^2 + 6xy - 5y^2$$

where z represents altitude.
(a) Which directions should we go to ascend/descend as quickly as possible?
(b) What is the angle between these directions?
(c) Find two linearly independent directions in which we stay at the same height.

Problem 3. Consider the following matrix and quadratic form:

$$B = \begin{bmatrix} 4 & 3 \\ 0 & \sqrt{7} \end{bmatrix} \qquad q(\vec{x}) = \|B\vec{x}\|^2$$

(a) Orthogonally diagonalize $B^T B$.
(b) What are the minimal and maximal values of $q(\vec{x})$ among all vectors with $\|\vec{x}\| = 1$.