Problems from the Textbook:

Section 11.1, pg. 692: 19, 21, 35.
Section 11.2, pg. 702: 31, 53.
Section 11.3, pg. 713: 21, 27.
Section 11.4, pg. 719: 9, 14.
Chapter 11 Review, pg. 732: 1, 15.
Section 13.1, pg. 833: 19, 33.
Section 13.2, pg. 841: 29, 31.
Section 13.3, pg. 848: 1, 11, 26, 39, 45, 49, 53.
Section 13.4, pg. 856: 9, 19, 33, 40, 45.
Section 13.7, pg. 878: 9, 21, 23, 49.
Chapter 13 Review, pg. 881: 11, 13, 41, 43.

Additional Problems:

1. Show that the line segments joining the midpoints of the sides of an arbitrary quadrilateral (taken in order) form a parallelogram.

2. Find two non-parallel vectors which are orthogonal to the vector \( \langle a_1, a_2, a_3 \rangle \), where \( a_1, a_2, \) and \( a_3 \) are real numbers not all zero. Characterize all vectors that are orthogonal to \( \langle a_1, a_2, a_3 \rangle \).

3. Find the distance from the origin to the plane \( 2x + y + z = 3 \) and to the line given by the parametric equations \( x = 1 + t, y = 2 - t, z = -1 + 2t \).

4. Write the equation \( z = x^2 - y^2 \) in (1) cylindrical and (2) spherical coordinates.

5. Determine whether the following statements are true or false. Justify your answer.

(a) The line \( \langle 1 + t, 1 - t, t \rangle \) intercepts the plane \( x + 2y + z = 0 \).

(b) If \( \mathbf{v}_1 \cdot (\mathbf{v}_2 \times \mathbf{v}_3) = 0 \), then \( \mathbf{v}_1, \mathbf{v}_2, \) and \( \mathbf{v}_3 \) are in the same plane.

(c) The curve \( \langle \sin t, \cos t, t \rangle \) lies on the surface \( x^2 + y^2 + z = 1 \).

(d) If \( \mathbf{v}_1, \mathbf{v}_2, \) and \( \mathbf{v}_3 \) are three dimensional vectors satisfying \( \mathbf{v}_1 \cdot \mathbf{v}_2 = 0 \) and \( \mathbf{v}_1 \cdot \mathbf{v}_3 = 0 \), then \( \mathbf{v}_2 \) and \( \mathbf{v}_3 \) are parallel.

(e) The lines

\[
L_1 : x(t) = 1 + t, \quad y(t) = t, \quad z(t) = 2 - 5t \\
L_2 : x(s) = 1 + 2s, \quad y(s) = 2s, \quad z(s) = 2 - 10s
\]

are identical.