Assignment 1

MATH 232: Applied Linear Algebra

September 6, 2022

1 Textbook Problems

- **Section 1.1:** 5(a), 7(b), 10, 11(b), 16, 17(a), 23, D9
- **Section 1.2:** 2(b), 3(d), 8, 15, 18, 19, 24, 27(b), D3 (a, b), D9, P4, P9
- **Section 1.3:** 3(b), 6(b), 7(b), 10, 11, 13, 21, 23, 28, 33, 36, 39, D3(a), D4,

2 Extra Problems

1. Normalize the vector $\mathbf{v} = \begin{bmatrix} 1 \\ 5 \\ -3 \end{bmatrix}$. In addition, find the unit vector that points in the opposite direction of $\mathbf{v}$.
2. Find the vector equation, general equation, and the normal equation of the plane the contains the points $P = (1, 1, 1), Q = (4, 0, 2)$, and $R = (0, 1, -1)$.
3. Find the angle between the planes $x - y + z = 5$ and $x + y + 2z = -3$.
4. Find the point on the plane $x + y - z = 0$ that is closest to the point $A = (1, -2, 1)$.
5. Find parametric equations for the plane in $\mathbb{R}^3$ defined by $2x + z = 1$.

6. Suppose ℓ is a line in $\mathbb{R}^2$ that passes through the point $\mathbf{x}_0 = (x_0, y_0)$ and $\mathbf{n} = \begin{bmatrix} n_1 \\ n_2 \end{bmatrix}$ is a vector that is perpendicular to ℓ. If $\mathbf{x} = (x, y)$ is any point on ℓ distinct from $\mathbf{x}_0$, show that

$$\mathbf{n} \cdot (\mathbf{x} - \mathbf{x}_0) = 0$$

is an equation for ℓ. This is called the *normal* equation of a line in $\mathbb{R}^2$.

7. Find the parametric equation for the line through $(5, 1, 0)$ that is perpendicular to the plane $2x - y + z = 1$.

8. Find the distance between the point $(1, 2, 3)$ ad the line with parametric equations $x = 2 + t$, $y = 2 - 3t$, and $z = 5t$.