Exercises

Chapter 6.1 # 3

Chapter 6.2 # 4, and also compute the angle between the two vectors.

Chapter 6.4 # 5, 7, 11, 13, 15, 19, 21

Problem A: Let $\mathbf{u} = (1, 1, 1)$, $\mathbf{v} = (1, 1, 0)$, and $\mathbf{w} = (1, 0, 0)$.
Find a linear combination of $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ that equals $(10, 2, -3)$.

Problem B: Let $\mathbf{u} = (1, -1, 0)$, $\mathbf{v} = (0, 1, -1)$, and $\mathbf{w} = (-1, 0, 1)$.
Find a linear combination of $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ that equals $(3, 1, -4)$.

Is $(1, 1, 1)$ a linear combination of $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$? Explain.

Bonus: Give a simple condition that describes when a vector (x, y, z) is a linear combination of the vectors $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$.

Problem C: In each part (1-5), answer:

- Is S closed under addition?
- Is S closed under scalar multiplication?
- Is S a subspace?

1. Let S consist of all vectors of the form $(0, x, x, y, y)$ in $\mathbb{R}^5$.
2. Let S consist of all vectors of the form $(1, x, x, y, y)$ in $\mathbb{R}^5$.
3. Let S consist of all vectors of the form $(x, y, x + y)$ in $\mathbb{R}^3$.
4. Let S consist of all vectors in $\mathbb{R}^2$ whose x coordinate is bigger than or equal to their y coordinate. Also, draw a picture of S.
5. Let S consist of all vectors in $\mathbb{R}^3$ whose dot product with $\mathbf{v} = \mathbf{i} - \mathbf{k}$ is zero.