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 \( u = (1,1,1), \ v = (1,1,0), \) and \( w = (1,0,0). \)

Find a linear combination of \( u, v, \) and \( w \) that equals \( (10, 2, -3). \)

Problem B: Let \( u = (1,-1,0), \ v = (0,1,-1), \) and \( w = (-1,0,1). \)

Find a linear combination of \( u, v, \) and \( w \) that equals \( (3,1,-4). \)

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

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

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 \( v = i - k \) is zero.