Linear Algebra Chapter 1

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December 29, 2022

End of Chapter Exercises

Section 1.1 Introduction

Question 1.

Determine whether the vectors emanating from the origin and terminating at the following pairs of points are parallel.

(a) (3,1,2) and (6,4,2)

(b) (-3,1,7) and (9,-3,-21)

(c) (5,-6,7) and (-5,6,-7)

(d) (2,0,-5) and (5,0,-2)

Question 2.

Find the equations of the lines through the following pairs of points in space.

(a) (3,-2,4) and (-5,7,1)

(b) (2,4,0) and (-3,-6,0)

(c) (3,7,2) and (3,7,-8)

(d) (-2,-1,5) and (3,9,7)

Question 3.

Find the equations of the planes containing the following points in space.

(a) (2,-5,-1), (0,4,6) and (-3,7,1)

(b) (3,-6,7), (-2,0,-4) and (5,-9,-2)

(c) (-8,2,0), (1,3,0) and (6,-5,0)

(d) (1,1,1), (5,5,5) and (-6,4,2)

Question 4.

What are the coordinates of the vector 0 in the Eucliean plane that satisfies Property 3? (There exists a vector denoted 0 such that $x + 0 = x$ for each vector x.)

Question 5.

Prove that if the vector x emanates from the origin of the Euclidean plane and terminates at the point with coordinates (a_1, a_2), then the vector tx that emanates from the origin terminates at the point with coordinates (ta_1, ta_2).

Question 6.

Show that the midpoint of the line segment joining the points (a, b) and (c, d) is $((a + c)/2, (b + d)/2)$.

Question 7.

Prove that the diagonals of a parallelogram bisect each other.

Section 1.2 Vector Spaces

Question 1.

Question 2.

Question 3.

Question 4.

Question 5.

Section 1.3 Subspaces

Question 1.

Question 2.

Question 3.

Question 4.

Question 5.

Section 1.4 Linear Combinations and Systems of Linear Equations

Question 1.

Question 2.

Question 3.

Question 4.

Question 5.

Section 1.5 Linear Dependence and Linear Independence

Question 1.

Question 2.

Question 3.

Question 4.

Question 5.

Section 1.6 Bases and Dimension

Question 1.

Question 2.

Question 3.

Question 4.

Question 5.

Section 1.7 Maximal Linearly Independent Subsets

Question 1.

Question 2.

Question 3.

Question 4.

Question 5.

Question 6.

Question 7.

Question 8.

Question 9.

Question 10.