

Math 210 (Lesieutre)
11.2: Vectors in three dimensions
January 11, 2017

Problem 1. Consider the two points in three dimensions with coordinates $P = (1, 2, 3)$ and $Q = (-1, 2, 1)$.

a) What is \overrightarrow{PQ} ? What is \overrightarrow{QP} ? How do these differ?

b) What is the length of \overrightarrow{PQ} ?

c) Find a vector of length 3 parallel to \overrightarrow{PQ} .

d) What is the midpoint of the line segment between P and Q ?

Problem 2. Describe the sphere with equation $(x - 1)^2 + (y + 2)^2 + (z - 3)^2 = 25$.

Problem 3. Relative to the air, an airplane is flying 30 degrees west of north, with speed 500 MPH. The wind is traveling due north at 100 MPH. What is the velocity vector of the airplane relative to the ground?

Problem 4. A 10-pound weight is suspended from two strings, each making a 45 degree angle with the ceiling. How much force is exerted on the mass by each of the strings?

Problem 5. Let R be a parallelogram with legs given by the vectors \mathbf{u} and \mathbf{v} . Prove that both diagonals of R have the same midpoint.