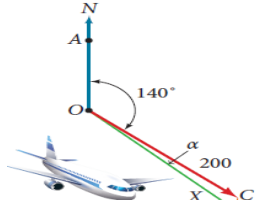


1. Goals



By the end of this unit, students will:

- understand the concepts and techniques in vectors, complex numbers, functions and graph sketching
- apply reasoning skills and solve problems in vectors, complex numbers, functions and graph sketching
- communicate their arguments and strategies when solving problems
- construct proofs of results
- interpret mathematical information and ascertain the reasonableness of their solutions to problems.

This week: Vectors in three dimensions

Vector and Cartesian equations:

- vector equation of a straight line and straight-line segment, given the position of two points
- examine the position of two particles each described as a vector function of time, and determine if their paths cross or if the particles meet

2. Theoretical Components

Notes and Examples: refer to G/Classroom under ABOUT/RESOURCES/SEM1/WK12 folder.

Lines in a plane and Space:

- [Equations of lines](https://goo.gl/jmf4g) - <https://goo.gl/jmf4g>
- [Video Example 1](https://goo.gl/hSjHtd) - <https://goo.gl/hSjHtd>
- [Video Example 2](https://goo.gl/uSGePg) - <https://goo.gl/uSGePg>
- [Video Example 3](https://goo.gl/Posb7A) - <https://goo.gl/Posb7A>

Deciding if Lines Coincide, Are Skew, Are Parallel or Intersect in 3D:

- Video Example: <https://goo.gl/c3byZT>
- Worked Example: <https://goo.gl/SmTX6Q>

Reading: <https://goo.gl/omzhv8>

3. Practical Components

Check Google Classroom WK12 folder and attempt questions from Section 17 on Lines and Planes in Space.

(Ex 17A.1, 17A.2, 17A.3, 17B.1, 17B.2, 17B.3)

4. Investigation

PART A:

Describe the relationship between the following two lines:

$$x - 1 = \frac{y + 2}{3} = 4 - z \quad \text{and} \quad \frac{x}{2} = y - 3 = \frac{z + 3}{4}$$

PART B:

The position vectors of the points A, B, C, D are

$$\mathbf{i} + \mathbf{j} + 3\mathbf{k}, \quad 3\mathbf{i} - \mathbf{j} + 5\mathbf{k}, \quad 3\mathbf{i} - \mathbf{j} + \mathbf{k}, \\ 5\mathbf{i} - 5\mathbf{j} + \alpha\mathbf{k}$$

respectively, where α is a positive integer. It is given that the shortest distance between the line AB and the line CD is equal to $2\sqrt{2}$. Show that the possible values of α are 3 and 5.

20 marks

5.QFO

Quiz/Forum/Other

Quiz 1 (Dot Product): <https://goo.gl/4LaVrw>

Quiz 2 (Lines and Planes): <https://goo.gl/qa9x0Y>