Test - Further vectors

Year: Further Maths · Duration: 60 minutes · /20

Name:	Date:	**Mark: /20**

Question	1	2	3	4	5	Total
marks	5	5	4	3	3	**20**
Mark						

Show your working.

Question 1 (5 marks)

Question 1 – Scalar and vector products

The vectors are $\mathbf{a} = \mathbf{i} + 2\mathbf{j} - \mathbf{k}$ and $\mathbf{b} = 3\mathbf{i} + 2\mathbf{k}$.

a. Find the angle between $\mathbf{a}$ and $\mathbf{b}$ to 1 decimal place. [3]
b. Find $\mathbf{a} \times \mathbf{b}$ and the area of the triangle with sides $\mathbf{a}$ and $\mathbf{b}$. [2]

Question 2 (5 marks)

Question 2 – Line and plane

The line l is $\mathbf{r} = (2, -1, 0) + \lambda(1, 2, -2)$ and the plane Π is $3x + y - z = 7$.

a. Find the coordinates of the point where l meets Π. [3]
b. Find the acute angle between l and Π to 1 decimal place. [2]

Question 3 (4 marks)

Question 3 – Equation of a plane

The points are $A(1, 1, 1)$, $B(2, 0, 3)$ and $C(0, 2, 2)$.

a. Find $\overrightarrow{AB} \times \overrightarrow{AC}$ and hence the Cartesian equation of the plane ABC. [3]

b. Find the distance from $D(3, 3, 3)$ to the plane. [1]

Question 4 (3 marks)

Question 4 – Distance from a point to a line

Find the shortest distance from $P(1, 4, 2)$ to the line $\mathbf{r} = (0, 1, 0) + \lambda(1, 1, 2)$. [3]

Question 5 (3 marks)

Question 5 – Problem: the solar panel

A solar panel lies in the plane $3x + 4z = 12$, where z is vertical and distances are in metres. Sunlight arrives in the direction $-\mathbf{i} - 2\mathbf{k}$.

a. Find the angle between the panel and the horizontal. [1]
b. Find the angle between the sunlight and the panel. [2]