

**GIRTON SUMMER PROGRAMME**

**MATHEMATICS FOR ENGINEERING**

# **VECTORS: HOMEWORK QUESTIONS**

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**The Homework Answers sheet can be downloaded from Moodle. Once completed (for all five homeworks) is must be uploaded as a “.pdf”.**

**Question: Vector-1**

Find the distance of the position vector  $(3, 2, 1)$  from the plane which passes through the three points  $(1, 2, 3)$ ,  $(4, 2, 2)$  and  $(1, 4, 2)$ .

Enter your value for the distance on the **Homework Answers sheet**.

**Question: Vector-2**

For a unit vector  $\mathbf{n}$  and a scalar quantity  $a > 0$ , what object does the equation

$$|\mathbf{r} \times \mathbf{n}| = a$$

represent where  $\mathbf{r}$  is a position vector in three-dimensional space?

Enter your description in the box on the **Homework Answers sheet**.

**Question: Vector-3**

Using some/all of the expressions  $\mathbf{a} \cdot \mathbf{b}$ ,  $\mathbf{a} \times \mathbf{b}$ ,  $\mathbf{a} \cdot \mathbf{b} \times \mathbf{c}$  or  $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$  where  $\mathbf{a}$ ,  $\mathbf{b}$  and  $\mathbf{c}$  are vectors in three-dimensional space, state:

- (i) the condition for two vectors to be independent in a plane;
- (ii) the condition for three vectors to be independent in three-dimensional space.

Enter your answers in the boxes on the **Homework Answers sheet**.