Exercise 3

Paper 2 style · Graphic display calculator

3 6 marks AHL 3.16 ●●● Demanding

The points $P(-1, 2, 1)$, $Q(2.5, 0, 3)$ and $R(1, 4.5, -1)$ are the vertices of a triangle.

(a) Find $\overrightarrow{PQ} \times \overrightarrow{PR}$. **[2]**

(b) Find the area of the triangle PQR. **[2]**

(c) Find the shortest distance from R to the line PQ. **[2]**

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

$\overrightarrow{PQ} = \begin{pmatrix} 3.5 \\ -2 \\ 2 \end{pmatrix}$, $\overrightarrow{PR} = \begin{pmatrix} 2 \\ 2.5 \\ -2 \end{pmatrix}$ **M1**

$\begin{pmatrix} -1 \\ 11 \\ 12.75 \end{pmatrix}$ **A1**

Total 2 marks

MARKSCHEME (b)

$\frac{1}{2}\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right| = \frac{1}{2} \times 16.868\ldots$ **M1**

$8.43\ \ (8.43449\ldots)$ **A1**

Total 2 marks

MARKSCHEME (c)

$\frac{16.868\ldots}{4.5}$ **M1**

$3.75\ \ (3.74866\ldots)$ **A1**

Total 2 marks

Note $\left|\overrightarrow{PQ}\right| = \sqrt{20.25} = 4.5$.