4 The points A, B, C and D are the vertices of a quadrilateral $ABCD$ such that

$\overrightarrow{AB} = 7\mathbf{i} + p\mathbf{j}$ $\overrightarrow{AC} = 11\mathbf{i} - p\mathbf{j}$ $\overrightarrow{AD} = 4\mathbf{i} - 2p\mathbf{j}$

(a) Show that, for all values of p, $ABCD$ is a parallelogram.

(3)

Given that $|\overrightarrow{BD}| = 3\sqrt{10}$

(b) find the possible values of p.

(3)

Given that $p > 0$

(c) find a unit vector which is parallel to $\overrightarrow{BD}$.

(1)

Question 4 continued

Question 4 continued

Question 4 continued

(Total for Question 4 is 7 marks)