## Question 3 (8 marks)

Figure 2 shows the quadrilateral $A B C D$, where $\overrightarrow{A B}=\boldsymbol{a}, \overrightarrow{B C}=\boldsymbol{b}$, and $\overrightarrow{C D}=\boldsymbol{c}$.
The points $E, F, G$, and $H$ are the midpoints of the sides $A B, B C, C D$, and $D A$ respectively.


Figure 2
(a) Find the following vectors in terms of $\boldsymbol{a}, \boldsymbol{b}$, and $\boldsymbol{c}$.
(i) $\overrightarrow{A D}$

(ii) $\overrightarrow{E F}$

(1 mark)
(iii) $\overrightarrow{H G}$

(2 marks)
(b) (i) Explain why $E F G H$ is a parallelogram.

(2 marks)
(ii) Show that the area of $E F G H$ is $\frac{1}{4}|(\boldsymbol{a} \times \boldsymbol{b})+(\boldsymbol{a} \times \boldsymbol{c})+(\boldsymbol{b} \times \boldsymbol{c})|$.

(2 marks)

