Question 4 (9 marks)

The points A(1,0,4), B(5,4,0), and C(7,-6,10) form the triangle ABC, as shown in Figure 2.

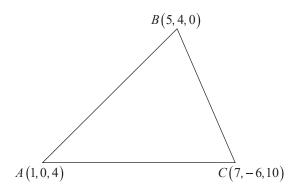
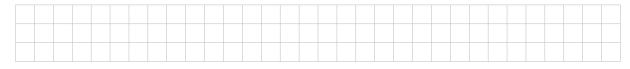


Figure 2

(a) (i) Find \overrightarrow{AB} .



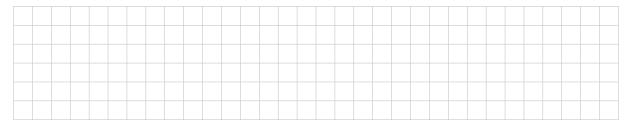
(1 mark)

(ii) Find $\overrightarrow{AB} \times \overrightarrow{AC}$.



(2 marks)

(iii) Find the ${\it exact}$ area of triangle ABC.



(2 marks)

(b) The point M (4, 3, 1) divides AB internally in the ratio 3:1. The point N (5, -4,8) divides AC internally in the ratio 2:1. That is, $\overrightarrow{AM}=3\overrightarrow{MB}$ and $\overrightarrow{AN}=2\overrightarrow{NC}$, as shown in Figure 3.

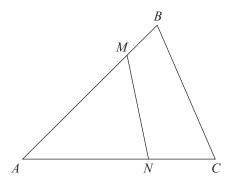
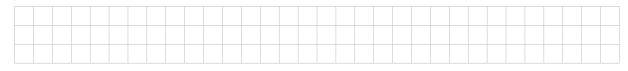


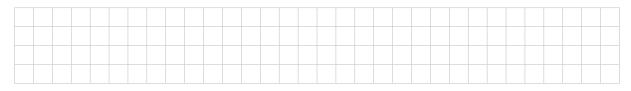
Figure 3

(i) Find \overrightarrow{AM} in terms of \overrightarrow{AB} .



(1 mark)

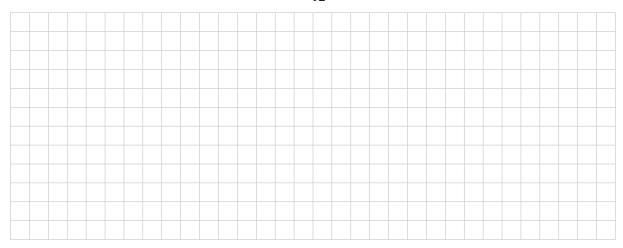
(ii) Find the **exact** area of triangle *AMN*.



(1 mark)

(iii) Find the coordinates of a point, P, on AC, such that:

the area of triangle $AMP = \frac{1}{12}$ the area of triangle ABC.



(2 marks)