9

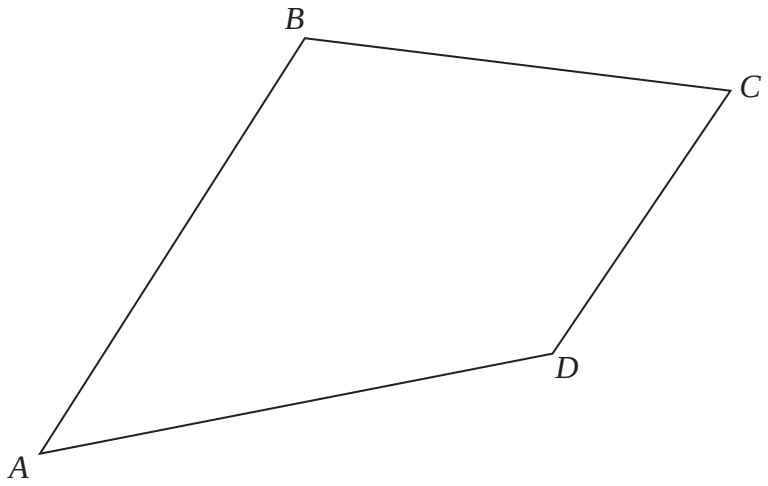

Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows quadrilateral *ABCD* such that

$$\overrightarrow{AD} = 2\mathbf{a} + \mathbf{b} \qquad \overrightarrow{BC} = \frac{1}{3}\mathbf{b} \qquad \overrightarrow{BD} = -4\mathbf{a} - \mathbf{b}$$

(a) Prove that $\overrightarrow{AB}$ is parallel to $\overrightarrow{DC}$

(4)

The diagonals, *AC* and *BD*, of the quadrilateral intersect at the point *Y*.

(b) Using a vector method, find $\overrightarrow{AY}$ as a simplified expression in terms of **a** and **b**

(6)

DO NOT WRITE IN THIS AREA
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Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 10 marks)

10 Using suitable results for $\sin(A + B)$ and $\sin(A - B)$ from the formulae page,

(a) show that $2\sin 4x \cos x = \sin 5x + \sin 3x$

(3)

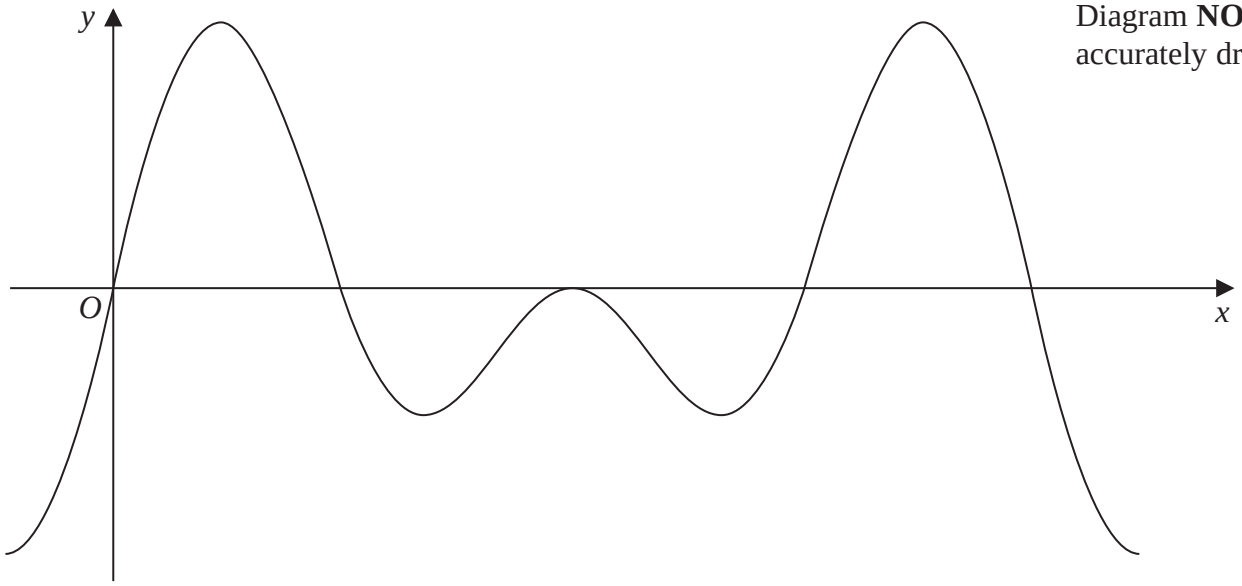

Diagram **NOT** accurately drawn

Figure 4

Figure 4 shows part of a sketch of the curve $y = 6\sin 4x \cos x$

(b) Using calculus, find the total area bounded by the curve and the x-axis between $x = 0$ and $x = \frac{\pi}{2}$

Give your answer to 3 significant figures.

(8)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 11 marks)

11 An equation of the straight line l is $y - 3x = 3$

The point A on l lies on the y-axis.
The point B on l has coordinates $(10, b)$, where b is an integer.
The point C divides AB in the ratio $2:3$

The straight line k passes through C and is perpendicular to l

(a) Show that an equation of k is

$$3y + x - 49 = 0$$

(6)

The point D with coordinates (p, q), where q is positive, is such that AD is parallel to k and the length of AD is $12\sqrt{10}$

(b) Find the coordinates of D

(6)

The point E lies on k such that DE is parallel to the y-axis.
The point F lies on l such that DF is parallel to the y-axis.

(c) Find the exact area of triangle ECF.

(5)

Question 11 continued

Question 11 continued

Question 11 continued

Question 11 continued

(Total for Question 11 is 17 marks)

TOTAL FOR PAPER IS 100 MARKS