10

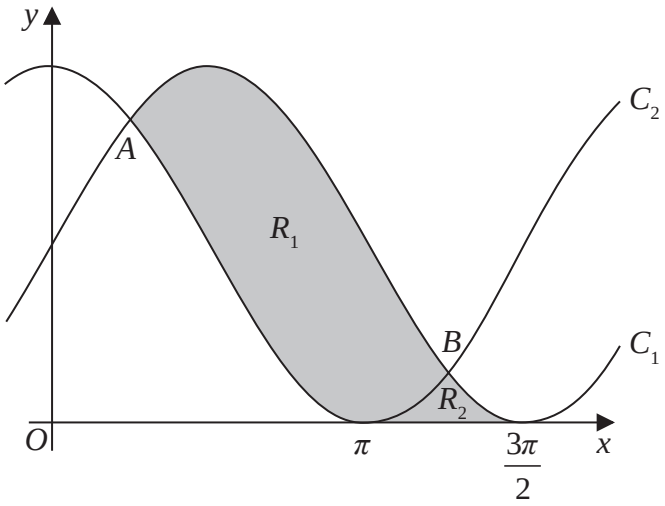

Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows part of the curve C_1 with equation $y = \sin x + 1$ and part of the curve C_2 with equation $y = \cos x + 1$

As shown in Figure 2, C_1 and C_2 intersect at the point A and at the point B

(a) Find the exact value of the x coordinate of A and the exact value of the x coordinate of B

(3)

The shaded finite region R_1 shown in Figure 2 is bounded by C_1 and C_2

The shaded finite region R_2 shown in Figure 2 is bounded by the x-axis, C_1 and C_2

(b) Use calculus to find the ratio

$$\text{area of } R_1 : \text{area of } R_2$$

Give your answer in the form $a : \left(\frac{\pi\sqrt{2}}{b} - c \right)$ where a, b and c are integers.

(9)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 12 marks)

11

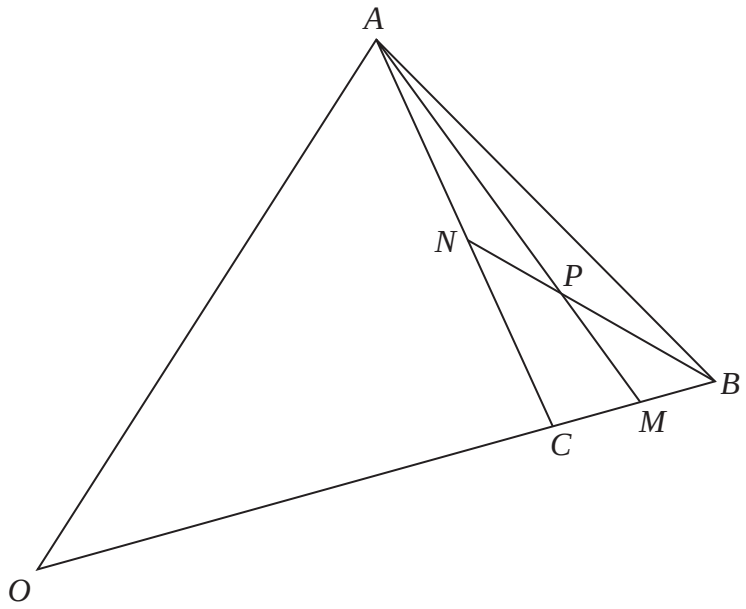

Diagram **NOT** accurately drawn

Figure 3

Figure 3 shows triangle OAB with $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

The point C lies on OB such that $OC : CB = 2 : 1$
The point M is the midpoint of CB and the point N is the midpoint of AC
The lines AM and NB intersect at the point P

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

(9)

The point Q is the midpoint of AB

(b) Using a vector method, show that C, P and Q are collinear.

(4)

Question 11 continued

Question 11 continued

(Total for Question 11 is 13 marks)

TOTAL FOR PAPER IS 100 MARKS