9.

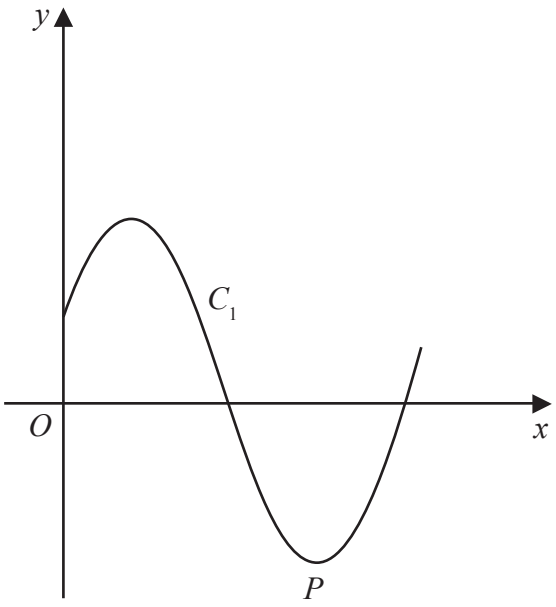


Figure 4

The curve C_1 has equation $y = \sin\left(x + \frac{\pi}{8}\right)$

Figure 4 shows a sketch of C_1 in the interval $0 \leqslant x < 2\pi$

The point P is a minimum turning point on C_1 and is shown in Figure 4.

(a) State the x coordinate of P.

(1)

(b) State the number of roots of the equation

$$\sin\left(x + \frac{\pi}{8}\right) = \sin\left(\frac{\pi}{8}\right)$$

in the interval $0 \leqslant x < 101\pi$, giving a reason for your answer.

(2)

The curve C_2 has equation $y = -5\sin\left(x + \frac{\pi}{8}\right)$

The point Q is the minimum turning point on C_2 in the interval $0 \leqslant x < 2\pi$

(c) State the coordinates of Q.

(2)

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Question 9 continued

(Total for Question 9 is 5 marks)

10. The curve C has equation

$$y = \frac{3k}{x - 2k} \qquad x \neq 2k$$

where k is a positive constant.

(a) Sketch a graph of C.
Show on your sketch the coordinates of the point where C crosses a coordinate axis.

(3)

The line l has equation $x + y = 12$

Given that l is a tangent to C,

(b) show that

$$k^2 - 15k + 36 = 0$$

(4)

The line l meets C at a point P.

Given that P lies below the x-axis,

(c) find the coordinates of P.

(*Solutions relying entirely on calculator technology are not acceptable.*)

(4)

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