8. A curve has equation

$$x = e^{2\tan y} \qquad -\frac{\pi}{2} < y < \frac{\pi}{2}$$

Show that

$$\frac{dy}{dx} = \frac{a}{x\left(b + (\ln x)^n\right)}$$

where a, b and n are integers to be found.

(4)

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Question 8 continued

(Total for Question 8 is 4 marks)

9. $h(x) = 8 + 3\sin x(\cos x - 2\sin x) \quad 0 \leqslant x \leqslant 2\pi$

(a) Write $h(x)$ in the form

$$P + R\sin(2x + \alpha)$$

where P, R and α are positive constants, $0 < \alpha < \frac{\pi}{2}$

Give the exact values of P and R and give the value of α, in radians, to 3 decimal places.

(6)

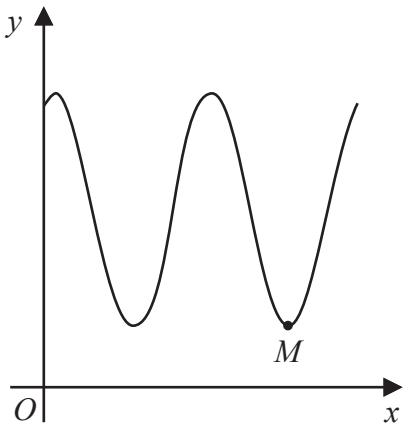


Figure 2

Figure 2 is a sketch of the curve with equation $y = h(x)$

(b) State the range of h.

(1)

The point M, shown in Figure 2, is the minimum point on the curve with the largest x coordinate.

(c) Find the x coordinate of M.

(Solutions based entirely on calculator technology are not acceptable.)

(2)

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