

9.

In this question you must show detailed reasoning.

Solutions relying entirely on calculator technology are not acceptable.

(i) Solve, for  $0 \leq x < 360^\circ$ , the equation

$$\sin x \tan x = 5$$

giving your answers to one decimal place.

(6)

(ii)

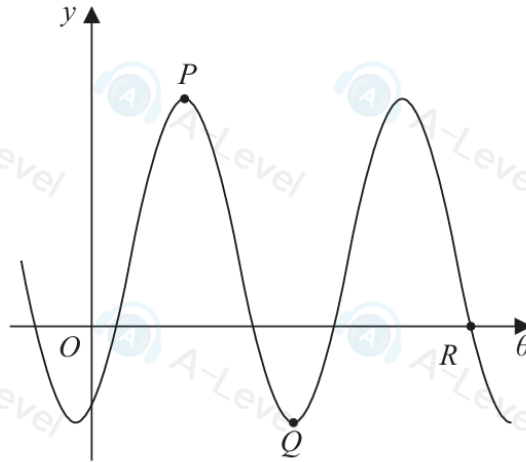


Figure 1

Figure 1 shows a sketch of part of the curve with equation

$$y = A \sin \left( 2\theta - \frac{3\pi}{8} \right) + 2$$

where  $A$  is a constant and  $\theta$  is measured in radians.The points  $P$ ,  $Q$  and  $R$  lie on the curve and are shown in Figure 1.Given that the  $y$  coordinate of  $P$  is 7(a) state the value of  $A$ ,

(1)

(b) find the exact coordinates of  $Q$ ,

(3)

(c) find the value of  $\theta$  at  $R$ , giving your answer to 3 significant figures.

(4)

7. (a) Show that the equation

$$8 \tan \theta = 3 \cos \theta$$

may be rewritten in the form

$$3 \sin^2 \theta + 8 \sin \theta - 3 = 0$$

(3)

(b) Hence solve, for  $0 \leq x \leq 90^\circ$ , the equation

$$8 \tan 2x = 3 \cos 2x$$

giving your answers to 2 decimal places.

(4)

blank

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

5. **In this question you must show all stages of your working.**  
**Solutions relying entirely on calculator technology are not acceptable.**

The depth of water,  $D$  metres, in a harbour on a particular day is given by the equation

$$D = 8 + 5 \sin\left(\frac{\pi t}{6} + 3\right) \quad 0 \leq t < 24$$

where  $t$  is the number of hours after **midnight**.

- (a) Show that the depth of water in the harbour at 2 am is just over 4 metres. (1)
- (b) Find, to the nearest minute, the first time after **midday** when the depth of water in the harbour is exactly 6 metres. (5)

10. **In this question you must show all stages of your working.**  
**Solutions relying entirely on calculator technology are not acceptable.**

- (a) Show that

$$\cos\theta \left(3 \tan\theta + \frac{2}{\tan\theta}\right) \equiv \sin\theta + \frac{2}{\sin\theta} \quad \theta \neq \frac{n\pi}{2} \quad (4)$$

- (b) Hence solve, for  $0 < x < 2\pi$ , the equation

$$\cos x \left(3 \tan x + \frac{2}{\tan x}\right) = 4 \sin x - 5$$

giving your answers to 3 significant figures. (4)