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

A curve C has equation $y = f(x), \quad x > 0$

A point P lies on C.

Given that

- $f'(x) = 4x^2 + \frac{6}{x^2} - 4$
- the equation of the tangent to C at P is $y = 10x - 6\sqrt{3}$

(a) (i) verify that $\sqrt{3}$ is a possible x coordinate of P,

(ii) find, using algebra, the other possible x coordinate of P.

(6)

Given that the x coordinate of P is $\sqrt{3}$

(b) find an equation of the normal to C at P.

(2)

(c) Find $f(x)$, writing your answer in simplest form.
You must show each stage of your working.

(4)

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Question 8 continued

Question 8 continued

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Question 8 continued

(Total for Question 8 is 12 marks)

9.

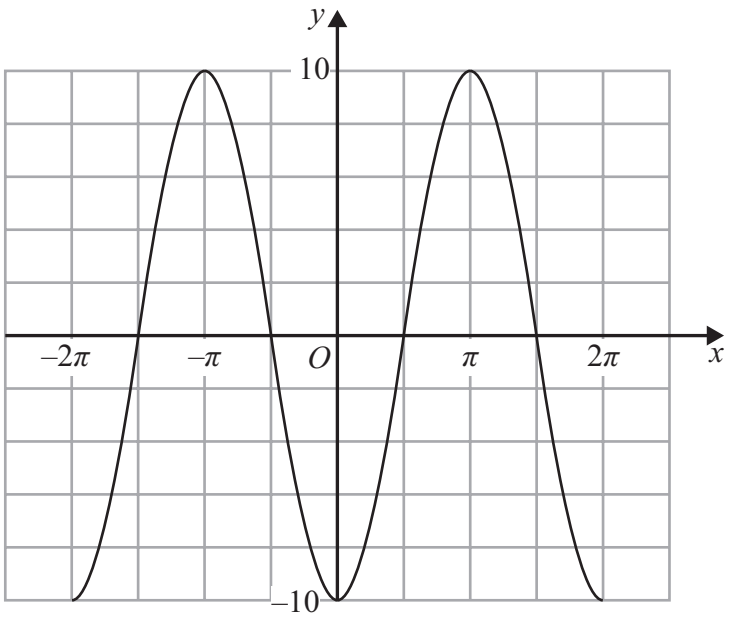

Figure 4

Figure 4 shows a sketch of part of the graph of the trigonometric function with equation $y = f(x)$.

(a) Write down an expression for $f(x)$.

(2)

Copies of Figure 4 (labelled Diagram 1 and Diagram 2) can be found on the following pages.

(b) (i) On Diagram 1 sketch a graph of the curve with equation

$$y = 10 - x^2$$

(ii) Hence find the **number** of solutions of the equation

$$f(x) = 10 - x^2 \quad \text{in the interval} \quad -100\pi \leqslant x \leqslant 100\pi$$

(3)

(c) (i) On Diagram 2 sketch a graph of the curve with equation

$$y = \tan x \qquad -2\pi \leqslant x \leqslant 2\pi$$

(ii) Hence find the **number** of solutions of the equation

$$f(x) = \tan x \quad \text{in the interval} \quad -100\pi \leqslant x \leqslant 100\pi$$

giving a reason for your answer.

(4)

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