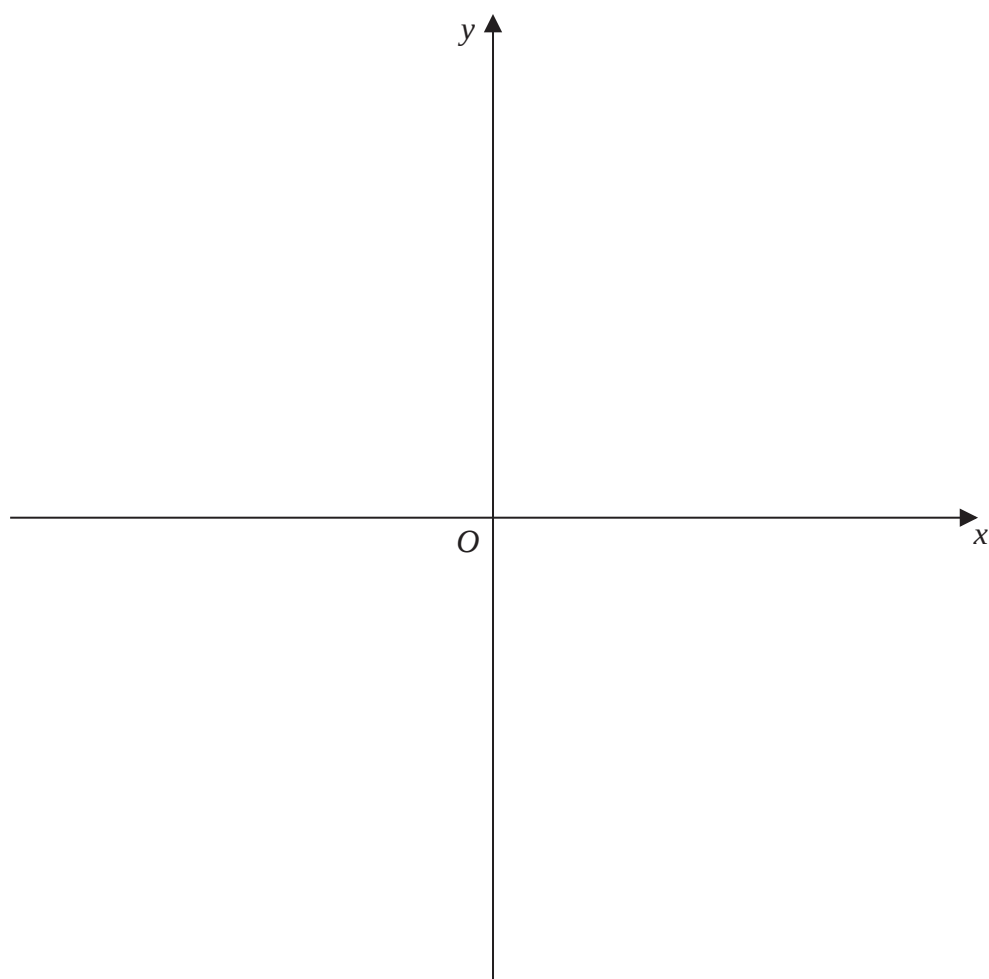








This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

5. (a) Sketch the graph with equation

$$y = |4x - 3|$$

stating the coordinates of any points where the graph cuts or meets the axes.

(2)

Find the complete set of values of x for which

- (b)

$$|4x - 3| > 2 - 2x$$

(4)

- (c)

$$|4x - 3| > \frac{3}{2} - 2x$$

(2)



Question 5 continued



6. The function f is defined by

$$f : x \rightarrow e^{2x} + k^2, \quad x \in \mathbb{R}, \quad k \text{ is a positive constant.}$$

(a) State the range of f . (1)

(b) Find f^{-1} and state its domain. (3)

The function g is defined by

$$g : x \rightarrow \ln(2x), \quad x > 0$$

(c) Solve the equation

$$g(x) + g(x^2) + g(x^3) = 6$$

giving your answer in its simplest form.

(4)

(d) Find $fg(x)$, giving your answer in its simplest form. (2)

(e) Find, in terms of the constant k , the solution of the equation

$$\text{fg}(x) = 2k^2 \tag{2}$$
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7.

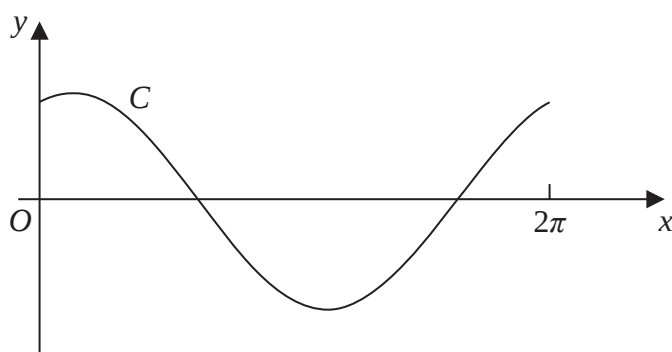


Figure 1

Figure 1 shows the curve C , with equation $y = 6 \cos x + 2.5 \sin x$ for $0 \leq x \leq 2\pi$

- (a) Express $6 \cos x + 2.5 \sin x$ in the form $R \cos(x - \alpha)$, where R and α are constants

with $R > 0$ and $0 < \alpha < \frac{\pi}{2}$. Give your value of α to 3 decimal places.

(3)

- (b) Find the coordinates of the points on the graph where the curve C crosses the coordinate axes.

(3)

A student records the number of hours of daylight each Sunday throughout the year. She starts on the last Sunday in May with a recording of 18 hours, and continues until her final recording 52 weeks later.

She models her results with the continuous function given by

$$H = 12 + 6 \cos\left(\frac{2\pi t}{52}\right) + 2.5 \sin\left(\frac{2\pi t}{52}\right), \quad 0 \leq t \leq 52$$

where H is the number of hours of daylight and t is the number of weeks since her first recording.

Use this function to find

- (c) the maximum and minimum values of H predicted by the model,

(3)

- (d) the values for t when $H = 16$, giving your answers to the nearest whole number.

[You must show your working. Answers based entirely on graphical or numerical methods are not acceptable.]

(6)



Question 7 continued

Blank lined area for writing the answer to Question 7.

Q7

(Total 15 marks)

TOTAL FOR PAPER: 75 MARKS

END

