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1. (a) By writing $\sin 3\theta$ as $\sin (2\theta + \theta)$, show that

$$\sin 3\theta = 3\sin \theta - 4\sin^3 \theta.$$

(5)

- (b) Given that $\sin \theta = \frac{\sqrt{3}}{4}$, find the exact value of $\sin 3\theta$.

(2)

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Question 1 continued

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Lined area for writing answers.

(Total 7 marks)

Q1

Q1



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Question 2 continued

Lined area for writing answers to Question 2.

(Total 8 marks)

Q2

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Question 3 continued

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Q3



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5.

Figure 1

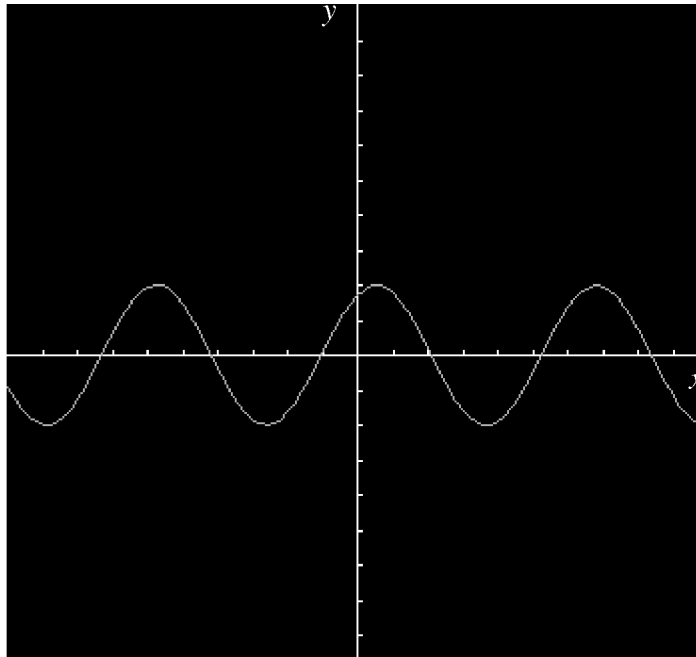


Figure 1 shows an oscilloscope screen.

The curve shown on the screen satisfies the equation

$$y = \sqrt{3} \cos x + \sin x.$$

- (a) Express the equation of the curve in the form $y = R \sin(x + \alpha)$, where R and α are constants, $R > 0$ and $0 < \alpha < \frac{\pi}{2}$. (4)

- (b) Find the values of x , $0 \leq x < 2\pi$, for which $y = 1$. (4)





Question 5 continued

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Q5

(Total 8 marks)



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6. The function f is defined by

$$f : x \mapsto \ln(4 - 2x), \quad x < 2 \quad \text{and} \quad x \in \mathbb{R}.$$

(a) Show that the inverse function of f is defined by

$$f^{-1} : x \mapsto 2 - \frac{1}{2}e^x$$

and write down the domain of f^{-1} .

(4)

(b) Write down the range of f^{-1} .

(1)

(c) In the space provided on page 16, sketch the graph of $y = f^{-1}(x)$. State the coordinates of the points of intersection with the x and y axes.

(4)

The graph of $y = x + 2$ crosses the graph of $y = f^{-1}(x)$ at $x = k$.

The iterative formula

$$x_{n+1} = -\frac{1}{2}e^{x_n}, \quad x_0 = -0.3$$

is used to find an approximate value for k .

(d) Calculate the values of x_1 and x_2 , giving your answers to 4 decimal places.

(2)

(e) Find the value of k to 3 decimal places.

(2)



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Question 6 continued



Question 7 continued

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(Total 13 marks)

Q7



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