

4.

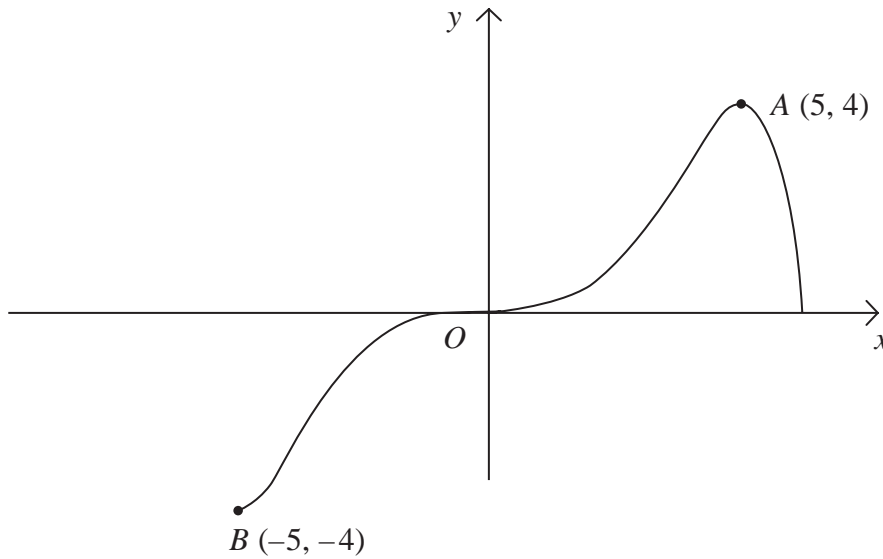


Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$.
The curve passes through the origin O and the points $A(5, 4)$ and $B(-5, -4)$.

In separate diagrams, sketch the graph with equation

(a) $y = |f(x)|$, (3)

(b) $y = f(|x|)$, (3)

(c) $y = 2f(x+1)$. (4)

On each sketch, show the coordinates of the points corresponding to A and B .



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Question 4 continued



H 2 6 3 1 5 R B 0 9 2 4

6. (a) Use the double angle formulae and the identity

$$\cos(A + B) \equiv \cos A \cos B - \sin A \sin B$$

to obtain an expression for $\cos 3x$ in terms of powers of $\cos x$ only.

(4)

- (b) (i) Prove that

$$\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x} \equiv 2 \sec x, \quad x \neq (2n+1)\frac{\pi}{2}.$$

(4)

- (ii) Hence find, for $0 < x < 2\pi$, all the solutions of

$$\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x} = 4.$$

(3)



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Question 6 continued

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7. A curve C has equation

$$y = 3 \sin 2x + 4 \cos 2x, \quad -\pi \leq x \leq \pi.$$

The point $A(0, 4)$ lies on C .

(a) Find an equation of the normal to the curve C at A . (5)

(b) Express y in the form $R \sin(2x + \alpha)$, where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$.

Give the value of α to 3 significant figures. (4)

(c) Find the coordinates of the points of intersection of the curve C with the x -axis.
Give your answers to 2 decimal places. (4)



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8. The functions f and g are defined by

$$f : x \mapsto 1 - 2x^3, \quad x \in \mathbb{R}$$

$$g : x \mapsto \frac{3}{x} - 4, \quad x > 0, \quad x \in \mathbb{R}$$

(a) Find the inverse function f^{-1} . (2)

(b) Show that the composite function gf is

$$gf : x \mapsto \frac{8x^3 - 1}{1 - 2x^3}.$$

(4)

(c) Solve $gf(x) = 0$. (2)

(d) Use calculus to find the coordinates of the stationary point on the graph of $y = gf(x)$. (5)



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Question 8 continued

Lined area for writing the answer to Question 8.

(Total 13 marks)

Q8

TOTAL FOR PAPER: 75 MARKS

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