



2.

$$f(x) = x^3 + 3x^2 + 4x - 12$$

(a) Show that the equation $f(x) = 0$ can be written as

$$x = \sqrt[3]{\left(\frac{4(3-x)}{(3+x)}\right)}, \quad x \neq -3 \quad (3)$$

The equation $x^3 + 3x^2 + 4x - 12 = 0$ has a single root which is between 1 and 2

(b) Use the iteration formula

$$x_{n+1} = \sqrt{\left(\frac{4(3-x_n)}{(3+x_n)}\right)}, n \geq 0$$

with $x_0 = 1$ to find, to 2 decimal places, the value of x_1 , x_2 and x_3 . (3)

The root of $f(x) = 0$ is α .

(c) By choosing a suitable interval, prove that $\alpha = 1.272$ to 3 decimal places. (3)



3.

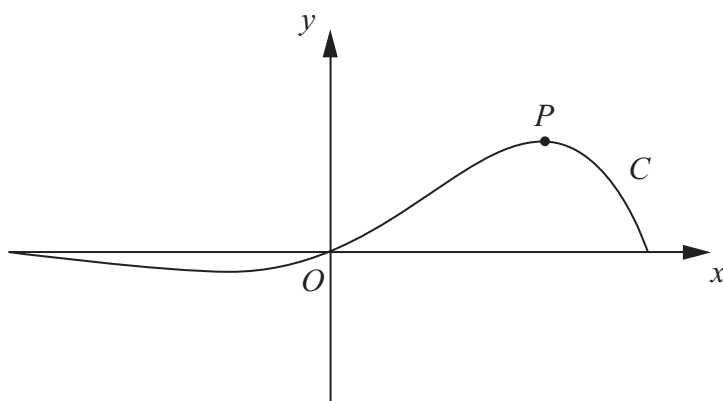


Figure 1

Figure 1 shows a sketch of the curve C which has equation

$$y = e^{x\sqrt{3}} \sin 3x, \quad -\frac{\pi}{3} \leq x \leq \frac{\pi}{3}$$

- (a) Find the x coordinate of the turning point P on C , for which $x > 0$.
Give your answer as a multiple of π .

(6)

- (b) Find an equation of the normal to C at the point where $x = 0$

(3)





4.

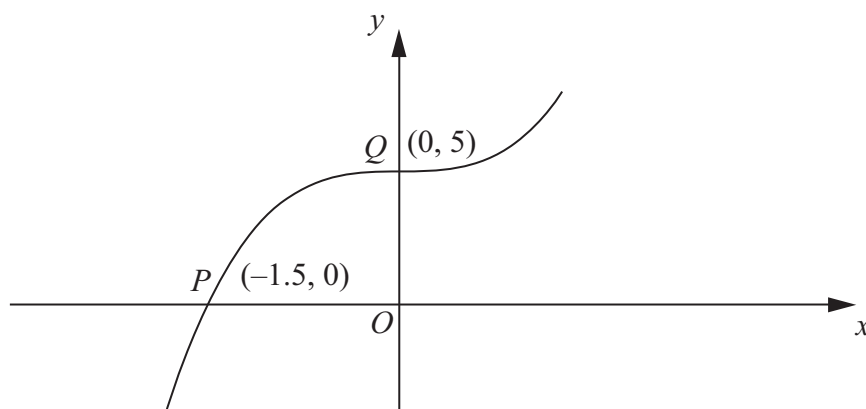


Figure 2

Figure 2 shows part of the curve with equation $y = f(x)$
The curve passes through the points $P(-1.5, 0)$ and $Q(0, 5)$ as shown.

On separate diagrams, sketch the curve with equation

(a) $y = |f(x)|$ (2)

(b) $y = f(|x|)$ (2)

(c) $y = 2f(3x)$ (3)

Indicate clearly on each sketch the coordinates of the points at which the curve crosses or meets the axes.



Question 4 continued





7. (a) Differentiate with respect to x ,

(i) $x^{\frac{1}{2}} \ln(3x)$

(ii) $\frac{1-10x}{(2x-1)^5}$, giving your answer in its simplest form.

(6)

(b) Given that $x = 3 \tan 2y$ find $\frac{dy}{dx}$ in terms of x .

(5)



8.

$$f(x) = 7 \cos 2x - 24 \sin 2x$$

Given that $f(x) = R \cos(2x + \alpha)$, where $R > 0$ and $0 < \alpha < 90^\circ$,

- (a) find the value of R and the value of α .

(3)

- (b) Hence solve the equation

$$7 \cos 2x - 24 \sin 2x = 12.5$$

for $0 \leq x < 180^\circ$, giving your answers to 1 decimal place.

(5)

- (c) Express $14\cos^2 x - 48\sin x \cos x$ in the form $a \cos 2x + b \sin 2x + c$, where a , b , and c are constants to be found.

(2)

- (d) Hence, using your answers to parts (a) and (c), deduce the maximum value of

$$14\cos^2 x - 48\sin x \cos x$$

(2)



Q8

END