

1. Differentiate with respect to x

$$(a) \ln(x^2 + 3x + 5) \quad (2)$$

$$(b) \quad \frac{\cos x}{x^2} \tag{3}$$



2.

$$f(x) = 2 \sin(x^2) + x - 2, \quad 0 \leq x < 2\pi$$

- (a) Show that $f(x)=0$ has a root α between $x=0.75$ and $x=0.85$

(2)

The equation $f(x)=0$ can be written as $x=\left[\arcsin(1-0.5x)\right]^{\frac{1}{2}}$.

- (b) Use the iterative formula

$$x_{n+1} = \left[\arcsin(1 - 0.5x_n) \right]^{\frac{1}{2}}, \quad x_0 = 0.8$$

to find the values of x_1 , x_2 and x_3 , giving your answers to 5 decimal places.

(3)

- (c) Show that $\alpha = 0.80157$ is correct to 5 decimal places.

(3)



3.

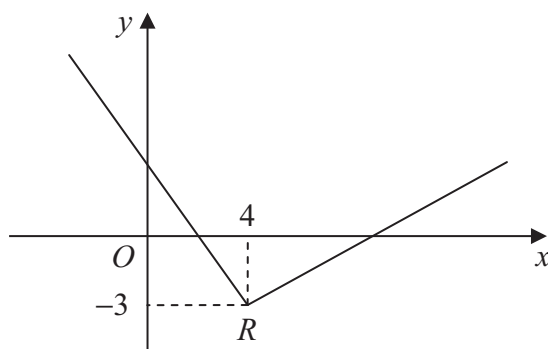
**Figure 1**

Figure 1 shows part of the graph of $y = f(x)$, $x \in \mathbb{R}$.

The graph consists of two line segments that meet at the point $R(4, -3)$, as shown in Figure 1.

Sketch, on separate diagrams, the graphs of

(a) $y = 2f(x+4)$, (3)

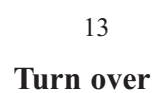
(b) $y = |f(-x)|$. (3)

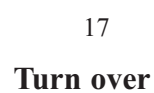
On each diagram, show the coordinates of the point corresponding to R .











(b) Show that $f'(x)$ can be written in the form

where R and α are the constants found in part (a).

- (c) Hence, or otherwise, find the smallest positive value of x for which the curve with equation $y = f(x)$ has a turning point.

Question 8 continued

Q8

(Total 12 marks)

TOTAL FOR PAPER: 75 MARKS

END

