



## Q1

(4)

Q1

## Q2

(1)

(2)

## Q2

3

N 2 5 5 6 1 A 0 3 2 4

### Q3

(4)

$$\frac{5-\sqrt{3}}{2+\sqrt{3}},$$

giving your answer in the form  $a + b\sqrt{3}$ , where  $a$  and  $b$  are integers.

**(Total 4 marks)**



## Q4

**(Total 7 marks)**

(4)

(3)

Q4

5

**Turn over**



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5. (a) Write  $\frac{2\sqrt{x+3}}{x}$  in the form  $2x^p+3x^q$  where  $p$  and  $q$  are constants. (2)

Given that  $y = 5x - 7 + \frac{2\sqrt{x+3}}{x}$ ,  $x > 0$ ,

- (b) find  $\frac{dy}{dx}$ , simplifying the coefficient of each term. (4)



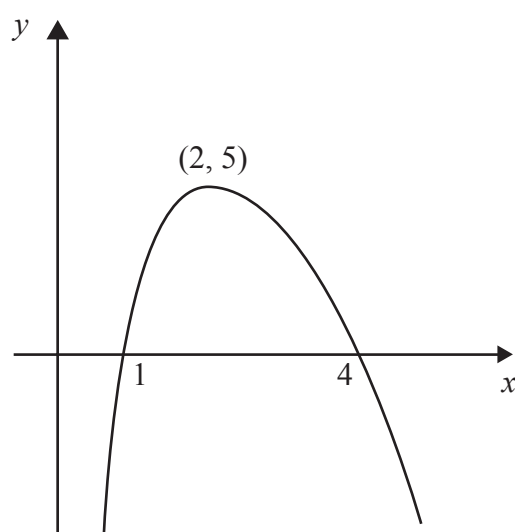


**Q5**

1



6.



**Figure 1**

Figure 1 shows a sketch of the curve with equation  $y = f(x)$ . The curve crosses the  $x$ -axis at the points  $(1, 0)$  and  $(4, 0)$ . The maximum point on the curve is  $(2, 5)$ .

In separate diagrams sketch the curves with the following equations.

On each diagram show clearly the coordinates of the maximum point and of each point at which the curve crosses the  $x$ -axis.

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

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

The maximum point on the curve with equation  $y = f(x + a)$  is on the  $y$ -axis.

(c) Write down the value of the constant  $a$ . (1)





## Q6



**Turn over**



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7. A sequence is given by:

$$\begin{aligned}x_1 &= 1, \\ x_{n+1} &= x_n(p + x_n),\end{aligned}$$

where  $p$  is a constant ( $p \neq 0$ ) .

- (a) Find  $x_2$  in terms of  $p$ . (1)

- (b) Show that  $x_3 = 1 + 3p + 2p^2$ . (2)

Given that  $x_3 = 1$ ,

- (c) find the value of  $p$ ,
- (3)**

- (d) write down the value of  $x_{2008}$ .

[illegible]

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### Q7

1049



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## 8. The equation

$$x^2 + kx + 8 = k$$

has no real solutions for  $x$ .

(a) Show that  $k$  satisfies  $k^2 + 4k - 32 < 0$ .

(3)

(b) Hence find the set of possible values of  $k$ .

(4)

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**Q8**

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9. The curve  $C$  has equation  $y = f(x)$ ,  $x > 0$ , and  $f'(x) = 4x - 6\sqrt{x} + \frac{8}{x^2}$ .

Given that the point  $P(4, 1)$  lies on  $C$ ,

- (a) find  $f(x)$  and simplify your answer.

(6)

- (b) Find an equation of the normal to  $C$  at the point  $P(4, 1)$ .

(4)

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**Q9**

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10. The curve  $C$  has equation

$$y = (x+3)(x-1)^2.$$

- (a) Sketch  $C$  showing clearly the coordinates of the points where the curve meets the coordinate axes.

(4)

- (b) Show that the equation of  $C$  can be written in the form

$$y = x^3 + x^2 - 5x + k,$$

where  $k$  is a positive integer, and state the value of  $k$ .

(2)

There are two points on  $C$  where the gradient of the tangent to  $C$  is equal to 3.

- (c) Find the  $x$ -coordinates of these two points.

(6)







Question 10 continued

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Lined area for writing the answer to Question 10.



**Q10**



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**11.** The first term of an arithmetic sequence is 30 and the common difference is  $-1.5$

(a) Find the value of the 25th term.

(2)

The  $r$ th term of the sequence is 0.

(b) Find the value of  $r$ .

(2)

The sum of the first  $n$  terms of the sequence is  $S_n$ .

(c) Find the largest positive value of  $S_n$ .

(3)

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## This image shows a full page of blank, lined paper. It features approximately 28 horizontal blue or grey lines spaced evenly apart, typical of notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings on the page.



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**Q11**

**TOTAL FOR PAPER: 75 MARKS**

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