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**Question 4 continued**

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Lined writing area for the answer to Question 4 continued.

**(Total 6 marks)**

**Q4**







6. A river, running between parallel banks, is 20 m wide. The depth,  $y$  metres, of the river measured at a point  $x$  metres from one bank is given by the formula

$$y = \frac{1}{10}x\sqrt{(20-x)}, \quad 0 \leq x \leq 20.$$

- (a) Complete the table below, giving values of  $y$  to 3 decimal places.

$x$	0	4	8	12	16	20
$y$	0		2.771			0

(2)

- (b) Use the trapezium rule with all the values in the table to estimate the cross-sectional area of the river.

(4)

Given that the cross-sectional area is constant and that the river is flowing uniformly at  $2 \text{ ms}^{-1}$ ,

- (c) estimate, in  $\text{m}^3$ , the volume of water flowing per minute, giving your answer to 3 significant figures.

(2)

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Question 6 continued

Lined area for writing the answer to Question 6.

(Total 8 marks)

Q6



N 2 3 4 9 2 B 0 1 3 2 8

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7. In the triangle  $ABC$ ,  $AB = 8$  cm,  $AC = 7$  cm,  $\angle ABC = 0.5$  radians and  $\angle ACB = x$  radians.

(a) Use the sine rule to find the value of  $\sin x$ , giving your answer to 3 decimal places. (3)

Given that there are two possible values of  $x$ ,

(b) find these values of  $x$ , giving your answers to 2 decimal places. (3)

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8. The circle  $C$ , with centre at the point  $A$ , has equation  $x^2 + y^2 - 10x + 9 = 0$ .

Find

- (a) the coordinates of  $A$ , (2)
- (b) the radius of  $C$ , (2)
- (c) the coordinates of the points at which  $C$  crosses the  $x$ -axis. (2)

Given that the line  $l$  with gradient  $\frac{7}{2}$  is a tangent to  $C$ , and that  $l$  touches  $C$  at the point  $T$ ,

- (d) find an equation of the line which passes through  $A$  and  $T$ . (3)

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**Question 8 continued**

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**Question 8 continued**

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**Q8**



N 2 3 4 9 2 B 0 1 9 2 8

9. (a) A geometric series has first term  $a$  and common ratio  $r$ . Prove that the sum of the first  $n$  terms of the series is

$$\frac{a(1-r^n)}{1-r} \quad (4)$$

Mr. King will be paid a salary of £35 000 in the year 2005. Mr. King's contract promises a 4% increase in salary every year, the first increase being given in 2006, so that his annual salaries form a geometric sequence.

- (b) Find, to the nearest £100, Mr. King's salary in the year 2008. (2)

Mr. King will receive a salary each year from 2005 until he retires at the end of 2024.

- (c) Find, to the nearest £1000, the total amount of salary he will receive in the period from 2005 until he retires at the end of 2024. (4)

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10.

Figure 1

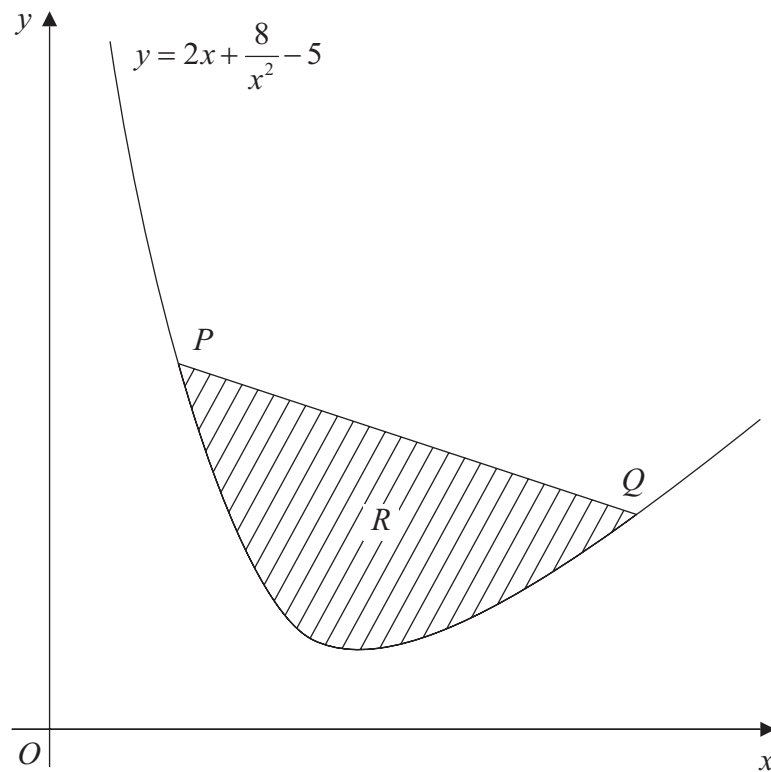


Figure 1 shows part of the curve  $C$  with equation  $y = 2x + \frac{8}{x^2} - 5$ ,  $x > 0$ .

The points  $P$  and  $Q$  lie on  $C$  and have  $x$ -coordinates 1 and 4 respectively. The region  $R$ , shaded in Figure 1, is bounded by  $C$  and the straight line joining  $P$  and  $Q$ .

(a) Find the exact area of  $R$ . (8)

(b) Use calculus to show that  $y$  is increasing for  $x > 2$ . (4)

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**Question 10 continued**

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**Question 10 continued**

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**Q10**

(Total 12 marks)

**TOTAL FOR PAPER: 75 MARKS**

**END**



N 2 3 4 9 2 B 0 2 7 2 8

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