

1. $f(x) = 2x^3 + x^2 - 5x + c$, where c is a constant.

Given that $f(1) = 0$,

- (a) find the value of c , (2)
- (b) factorise $f(x)$ completely, (4)
- (c) find the remainder when $f(x)$ is divided by $(2x - 3)$. (2)



Question 1 continued

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Q1

Box for marking the answer to Question 1.

(Total 8 marks)



2. (a) Find the first 3 terms, in ascending powers of x , of the binomial expansion of

where p is a constant.

These first 3 terms are 1, $36x$ and qx^2 , where q is a constant.

(b) Find the value of p and the value of q .

Question 2 continued

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Q2

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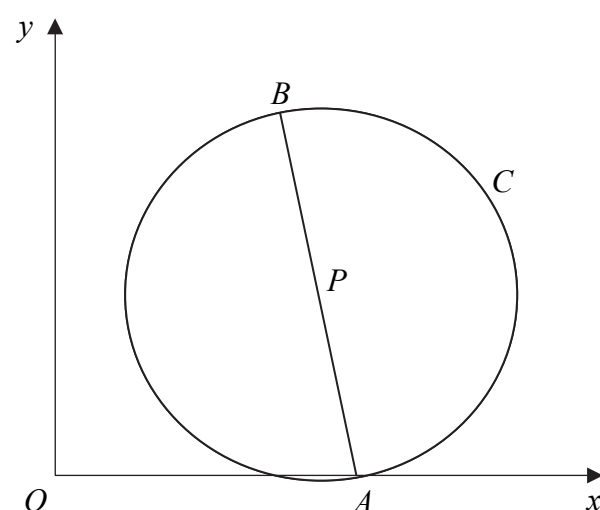
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3.

Figure 1



In Figure 1, $A(4, 0)$ and $B(3, 5)$ are the end points of a diameter of the circle C .

Find

- (a) the exact length of AB , (2)
- (b) the coordinates of the midpoint P of AB , (2)
- (c) an equation for the circle C . (3)



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Question 3 continued

(Total 7 marks)

Q3



4. The first term of a geometric series is 120. The sum to infinity of the series is 480.

- (b) Find, to 2 decimal places, the difference between the 5th and 6th term.

- (c) Calculate the sum of the first 7 terms.

The sum of the first n terms of the series is greater than 300.

- (d) Calculate the smallest possible value of n . **(4)**

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Question 4 continued

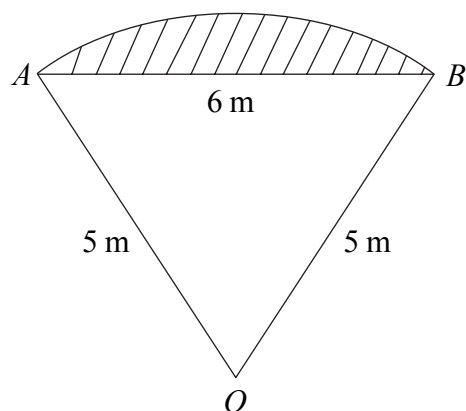
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Q4



5.

Figure 2



In Figure 2 OAB is a sector of a circle radius 5 m. The chord AB is 6 m long.

- (a) Show that $\cos \hat{AOB} = \frac{7}{25}$. (2)
- (b) Hence find the angle \hat{AOB} in radians, giving your answer to 3 decimal places. (1)
- (c) Calculate the area of the sector OAB . (2)
- (d) Hence calculate the shaded area. (3)



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Question 5 continued

(Total 8 marks)

Q5



6. The speed, $v \text{ m s}^{-1}$, of a train at time t seconds is given by

$$v = \sqrt[3]{(1.2^t - 1)}, \quad 0 \leq t \leq 30.$$

The following table shows the speed of the train at 5 second intervals.

t	0	5	10	15	20	25	30
v	0	1.22	2.28		6.11		

- (a) Complete the table, giving the values of v to 2 decimal places.

(3)

The distance, s metres, travelled by the train in 30 seconds is given by

$$s = \int_0^{30} \sqrt[3]{(1.2^t - 1)} dt .$$

- (b) Use the trapezium rule, with all the values from your table, to estimate the value of s .

(3)



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Question 6 continued

(Total 6 marks)

Q6



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7. The curve C has equation

$$y = 2x^3 - 5x^2 - 4x + 2.$$

- (a) Find $\frac{dy}{dx}$. (2)
- (b) Using the result from part (a), find the coordinates of the turning points of C . (4)
- (c) Find $\frac{d^2y}{dx^2}$. (2)
- (d) Hence, or otherwise, determine the nature of the turning points of C . (2)



Question 7 continued

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Handwriting practice area with 30 horizontal lines.

(Total 10 marks)

Q7



8. (a) Find all the values of θ , to 1 decimal place, in the interval $0^\circ \leq \theta < 360^\circ$ for which

(4)

Q8

(b) Find all the values of θ , to 1 decimal place, in the interval $0^\circ \leq \theta < 360^\circ$ for which

$$\tan^2 \theta = 4.$$

(Total 9 marks)



9.

Figure 3

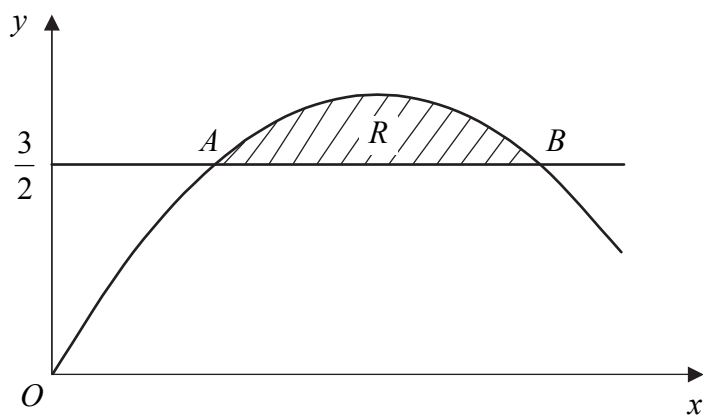


Figure 3 shows the shaded region R which is bounded by the curve $y = -2x^2 + 4x$ and the line $y = \frac{3}{2}$. The points A and B are the points of intersection of the line and the curve.

Find

- (a) the x -coordinates of the points A and B ,

(4)

- (b) the exact area of R .

(6)



Question 9 continued

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Question 9 continued

(Total 10 marks)

Q9

TOTAL FOR PAPER: 75 MARKS

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