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1. Given that $y = x^4 + 6x^{\frac{1}{2}}$, find in their simplest form

(a) $\frac{dy}{dx}$ (3)

(b) $\int y dx$ (3)

Horizontal lines for writing answers.



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2. (a) Simplify

$$\sqrt{32} + \sqrt{18}$$

giving your answer in the form $a\sqrt{2}$, where a is an integer.

(2)

(b) Simplify

$$\frac{\sqrt{32} + \sqrt{18}}{3 + \sqrt{2}}$$

giving your answer in the form $b\sqrt{2} + c$, where b and c are integers.

(4)



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Question 2 continued

Blank writing area for Question 2 continued, consisting of 30 horizontal lines.

(Total 6 marks)

Q2



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4. A sequence x_1, x_2, x_3, \dots is defined by

$$x_1 = 1$$

$$x_{n+1} = ax_n + 5, \quad n \geq 1$$

where a is a constant.

(a) Write down an expression for x_2 in terms of a .

(1)

(b) Show that $x_3 = a^2 + 5a + 5$

(2)

Given that $x_3 = 41$

(c) find the possible values of a .

(3)



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Question 4 continued

Area containing horizontal lines for writing the answer to Question 4.

(Total 6 marks)

Q4



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Question 5 continued

Q5

(Total 8 marks)



6.

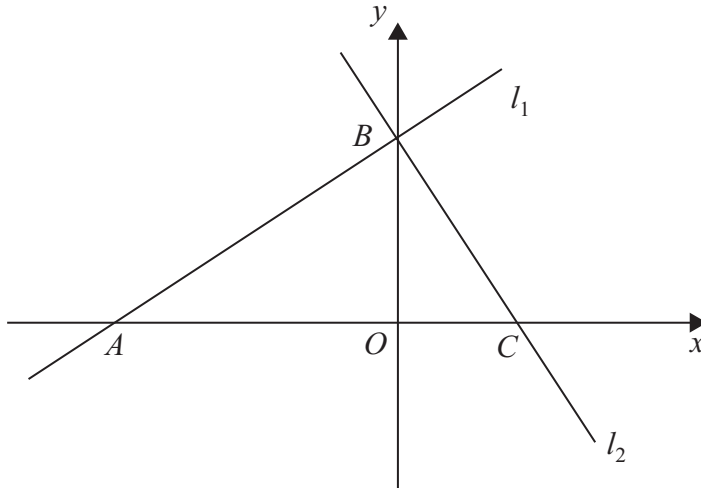


Figure 1

The line l_1 has equation $2x - 3y + 12 = 0$

(a) Find the gradient of l_1 . (1)

The line l_1 crosses the x -axis at the point A and the y -axis at the point B , as shown in Figure 1.

The line l_2 is perpendicular to l_1 and passes through B .

(b) Find an equation of l_2 . (3)

The line l_2 crosses the x -axis at the point C .

(c) Find the area of triangle ABC . (4)



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Question 6 continued

Lined area for writing answers, containing 25 horizontal lines.



P 4 0 0 8 2 A 0 1 3 2 8

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Question 6 continued

Horizontal lines for writing.

(Total 8 marks)

Q6



P 4 0 0 8 2 A 0 1 5 2 8

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8. The curve C_1 has equation

$$y = x^2(x + 2)$$

(a) Find $\frac{dy}{dx}$

(2)

(b) Sketch C_1 , showing the coordinates of the points where C_1 meets the x -axis.

(3)

(c) Find the gradient of C_1 at each point where C_1 meets the x -axis.

(2)

The curve C_2 has equation

$$y = (x - k)^2(x - k + 2)$$

where k is a constant and $k > 2$

(d) Sketch C_2 , showing the coordinates of the points where C_2 meets the x and y axes.

(3)



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Question 8 continued



Question 8 continued

Horizontal lines for writing answers.



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Question 8 continued

Q8

(Total 10 marks)



9. A company offers two salary schemes for a 10-year period, Year 1 to Year 10 inclusive.

Scheme 1: Salary in Year 1 is £ P .
Salary increases by £ $(2T)$ each year, forming an arithmetic sequence.

Scheme 2: Salary in Year 1 is £ $(P + 1800)$.
Salary increases by £ T each year, forming an arithmetic sequence.

(a) Show that the **total** earned under Salary Scheme 1 for the 10-year period is

$$\pounds(10P + 90T) \tag{2}$$

For the 10-year period, the **total** earned is the same for both salary schemes.

(b) Find the value of T . (4)

For this value of T , the salary in Year 10 under Salary Scheme 2 is £29 850

(c) Find the value of P . (3)



10.

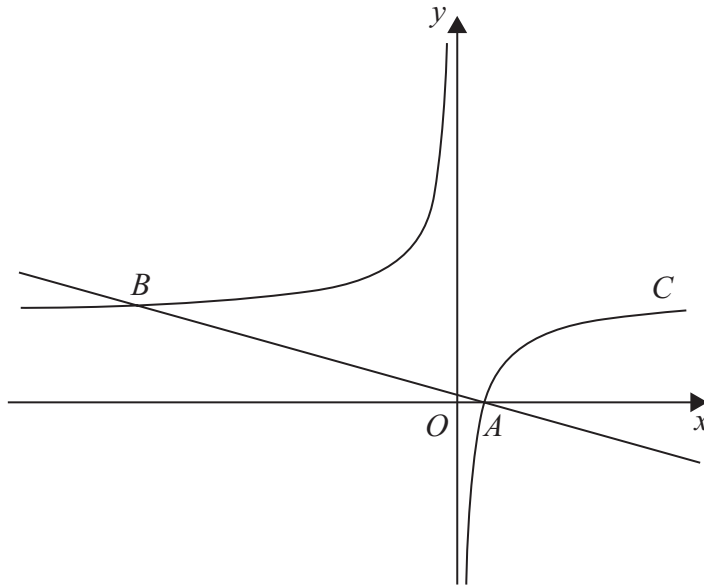


Figure 2

Figure 2 shows a sketch of the curve C with equation

$$y = 2 - \frac{1}{x}, \quad x \neq 0$$

The curve crosses the x -axis at the point A .

(a) Find the coordinates of A . (1)

(b) Show that the equation of the normal to C at A can be written as $2x + 8y - 1 = 0$. (6)

The normal to C at A meets C again at the point B , as shown in Figure 2.

(c) Find the coordinates of B . (4)



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Question 10 continued

Handwriting practice area consisting of 28 horizontal lines.

Q10

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(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

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