



1. Find

$$\int \left( 6x^2 + \frac{2}{x^2} + 5 \right) dx$$

giving each term in its simplest form.

**(4)**

Lined area for working out the integral.

**(Total 4 marks)**

Q1













5. A sequence of numbers  $a_1, a_2, a_3 \dots$  is defined by

$$a_1 = 3$$

$$a_{n+1} = 2a_n - c \quad (n \geq 1)$$

where  $c$  is a constant.

(a) Write down an expression, in terms of  $c$ , for  $a_2$  **(1)**

(b) Show that  $a_3 = 12 - 3c$  **(2)**

Given that  $\sum_{i=1}^4 a_i \geq 23$

(c) find the range of values of  $c$ . **(4)**

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6. A boy saves some money over a period of 60 weeks. He saves 10p in week 1, 15p in week 2, 20p in week 3 and so on until week 60. His weekly savings form an arithmetic sequence.

(a) Find how much he saves in week 15

(2)

(b) Calculate the total amount he saves over the 60 week period.

(3)

The boy's sister also saves some money each week over a period of  $m$  weeks. She saves 10p in week 1, 20p in week 2, 30p in week 3 and so on so that her weekly savings form an arithmetic sequence. She saves a total of £63 in the  $m$  weeks.

(c) Show that

$$m(m + 1) = 35 \times 36$$

(4)

(d) Hence write down the value of  $m$ .

(1)

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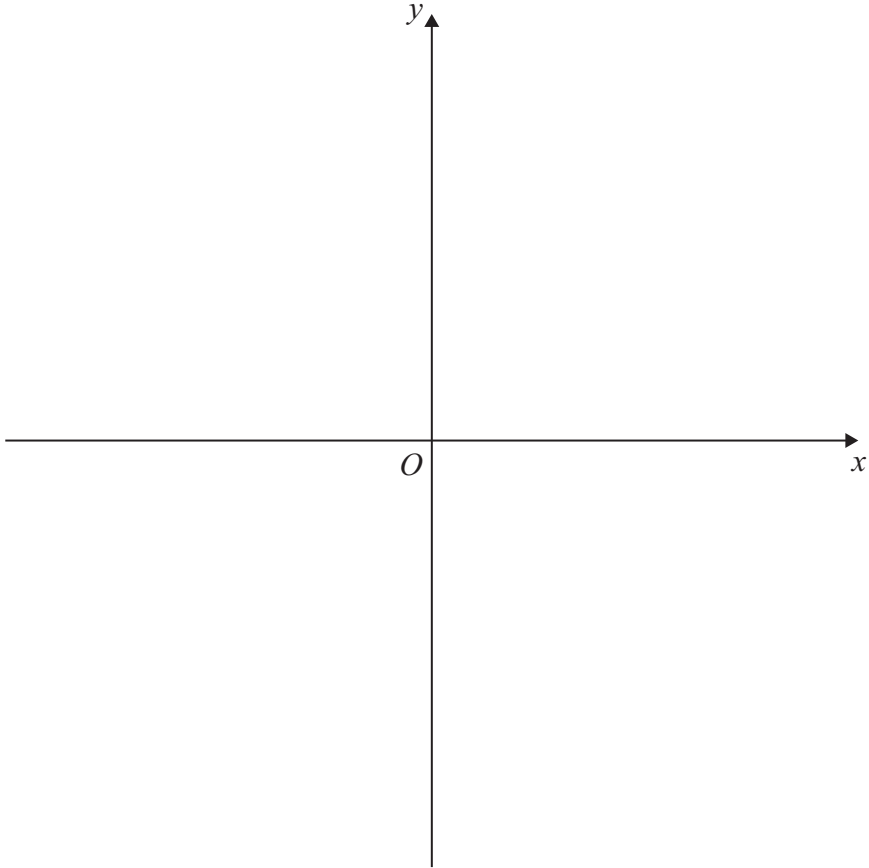








**Question 8 continued**



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**Q8**

**(Total 8 marks)**



9. The line  $L_1$  has equation  $4y + 3 = 2x$

The point  $A(p, 4)$  lies on  $L_1$

(a) Find the value of the constant  $p$ . (1)

The line  $L_2$  passes through the point  $C(2, 4)$  and is perpendicular to  $L_1$

(b) Find an equation for  $L_2$  giving your answer in the form  $ax + by + c = 0$ , where  $a, b$  and  $c$  are integers. (5)

The line  $L_1$  and the line  $L_2$  intersect at the point  $D$ .

(c) Find the coordinates of the point  $D$ . (3)

(d) Show that the length of  $CD$  is  $\frac{3}{2}\sqrt{5}$  (3)

A point  $B$  lies on  $L_1$  and the length of  $AB = \sqrt{80}$

The point  $E$  lies on  $L_2$  such that the length of the line  $CDE = 3$  times the length of  $CD$ .

(e) Find the area of the quadrilateral  $ACBE$ . (3)

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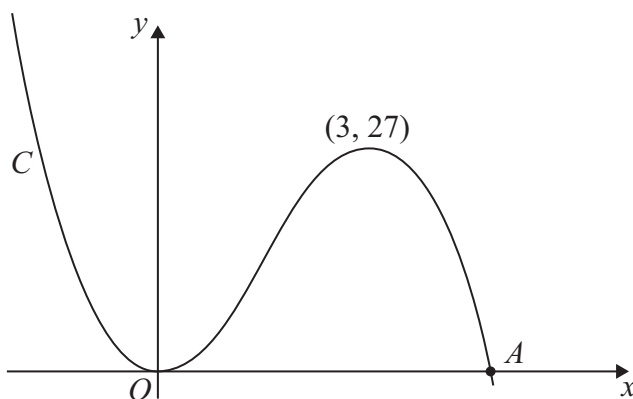


Figure 1

Figure 1 shows a sketch of the curve  $C$  with equation  $y = f(x)$  where

$$f(x) = x^2(9 - 2x)$$

There is a minimum at the origin, a maximum at the point  $(3, 27)$  and  $C$  cuts the  $x$ -axis at the point  $A$ .

(a) Write down the coordinates of the point  $A$ . (1)

(b) On separate diagrams sketch the curve with equation

(i)  $y = f(x + 3)$

(ii)  $y = f(3x)$

On each sketch you should indicate clearly the coordinates of the maximum point and any points where the curves cross or meet the coordinate axes. (6)

The curve with equation  $y = f(x) + k$ , where  $k$  is a constant, has a maximum point at  $(3, 10)$ .

(c) Write down the value of  $k$ . (1)

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