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3. A company predicts a yearly profit of £120 000 in the year 2013. The company predicts that the yearly profit will rise each year by 5%. The predicted yearly profit forms a geometric sequence with common ratio 1.05

(a) Show that the predicted profit in the year 2016 is £138 915 (1)

(b) Find the first year in which the yearly predicted profit exceeds £200 000 (5)

(c) Find the total predicted profit for the years 2013 to 2023 inclusive, giving your answer to the nearest pound. (3)

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**Question 3 continued**

Lined area for writing the answer to Question 3.

**(Total 9 marks)**

**Q3**



P 4 1 4 8 7 A 0 9 3 2



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**Question 4 continued**

Lined writing area for the answer to Question 4.

**(Total 7 marks)**

Q4



P 4 1 4 8 7 A 0 1 1 3 2

5. The circle  $C$  has equation

$$x^2 + y^2 - 20x - 24y + 195 = 0$$

The centre of  $C$  is at the point  $M$ .

(a) Find

- (i) the coordinates of the point  $M$ ,
- (ii) the radius of the circle  $C$ .

**(5)**

$N$  is the point with coordinates  $(25, 32)$ .

(b) Find the length of the line  $MN$ .

**(2)**

The tangent to  $C$  at a point  $P$  on the circle passes through point  $N$ .

(c) Find the length of the line  $NP$ .

**(2)**

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**Question 5 continued**

Lined writing area for the answer to Question 5. The page contains 25 horizontal lines.







6. Given that

$$2\log_2(x+15) - \log_2 x = 6$$

(a) Show that

$$x^2 - 34x + 225 = 0$$

(5)

(b) Hence, or otherwise, solve the equation

$$2\log_2(x+15) - \log_2 x = 6$$

(2)

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**Question 6 continued**

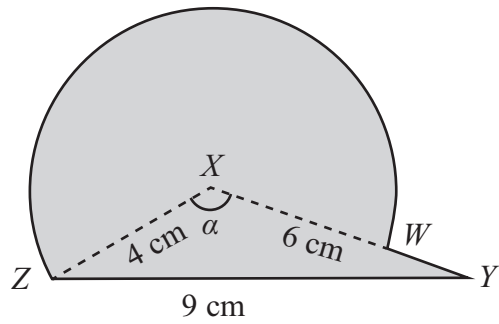
Lined area for writing the answer to Question 6.

**(Total 7 marks)**

Q6



7.



**Figure 1**

The triangle  $XYZ$  in Figure 1 has  $XY = 6$  cm,  $YZ = 9$  cm,  $ZX = 4$  cm and angle  $ZXY = \alpha$ . The point  $W$  lies on the line  $XY$ .

The circular arc  $ZW$ , in Figure 1 is a major arc of the circle with centre  $X$  and radius 4 cm.

(a) Show that, to 3 significant figures,  $\alpha = 2.22$  radians. **(2)**

(b) Find the area, in  $\text{cm}^2$ , of the major sector  $XZWX$ . **(3)**

The region enclosed by the major arc  $ZW$  of the circle and the lines  $WY$  and  $YZ$  is shown shaded in Figure 1.

Calculate

(c) the area of this shaded region, **(3)**

(d) the perimeter  $ZWYZ$  of this shaded region. **(4)**

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Question 7 continued

Ruled writing area with 28 horizontal lines.

Q7

(Total 12 marks)

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**Question 8 continued**

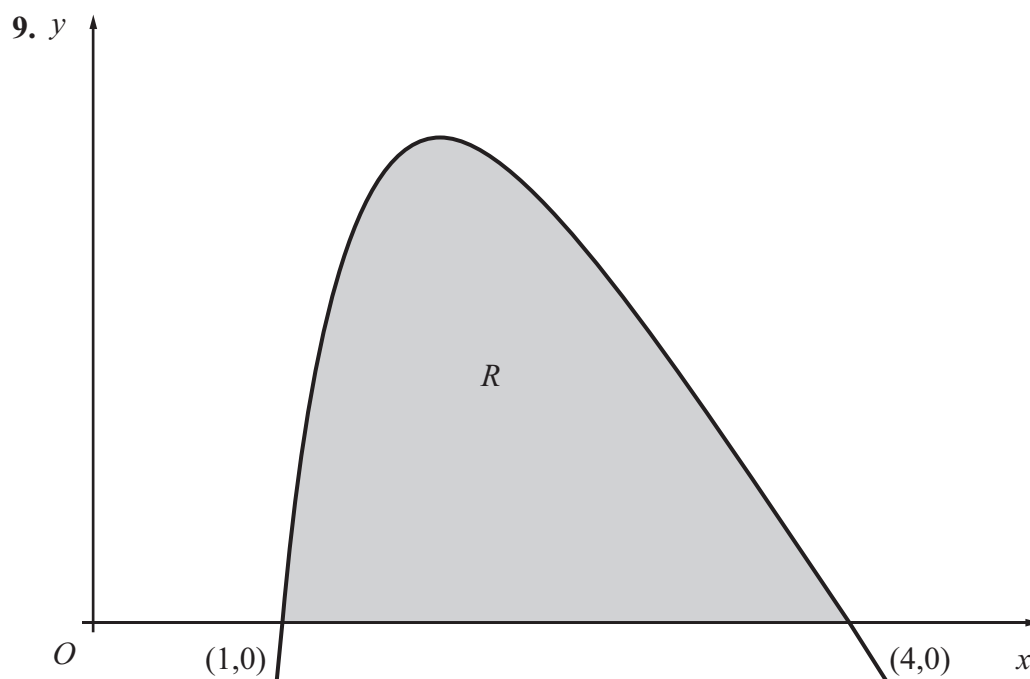
Handwriting lines for the answer to Question 8.

**(Total 9 marks)**

**Q8**



P 4 1 4 8 7 A 0 2 7 3 2



**Figure 2**

The finite region  $R$ , as shown in Figure 2, is bounded by the  $x$ -axis and the curve with equation

$$y = 27 - 2x - 9\sqrt{x} - \frac{16}{x^2}, \quad x > 0$$

The curve crosses the  $x$ -axis at the points  $(1, 0)$  and  $(4, 0)$ .

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

$x$	1	1.5	2	2.5	3	3.5	4
$y$	0	5.866		5.210		1.856	0

**(2)**

(b) Use the trapezium rule with all the values in the completed table to find an approximate value for the area of  $R$ , giving your answer to 2 decimal places.

**(4)**

(c) Use integration to find the exact value for the area of  $R$ .

**(6)**

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Question 9 continued

Lined area for writing the answer to Question 9.



