8. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

(a) Show that

$$\frac{\sec\theta\,\text{cosec}\theta}{4\text{cosec}\,4\theta} \equiv \cos 2\theta$$

(2)

(b) Hence show that the equation

$$4(5\cos^2\theta - 9)\,\text{cosec}\,4\theta = 3(1 + \tan^2 2\theta)\sec\theta\,\text{cosec}\,\theta$$

can be written as

$$a\cos^2 2\theta + b\cos 2\theta + c = 0$$

where a, b and c are integers to be found.

(3)

(c) Hence, solve for $0 < x < 180°$, $x \neq (45n)°$, $n \in \mathbb{N}$, the equation

$$4(5\cos^2 x - 9)\,\text{cosec}\,4x = 3(1 + \tan^2 2x)\sec x\,\text{cosec}\,x$$

giving the answers to one decimal place.

(4)

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Question 8 continued

Question 8 continued

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Question 8 continued

(Total for Question 8 is 9 marks)

9.

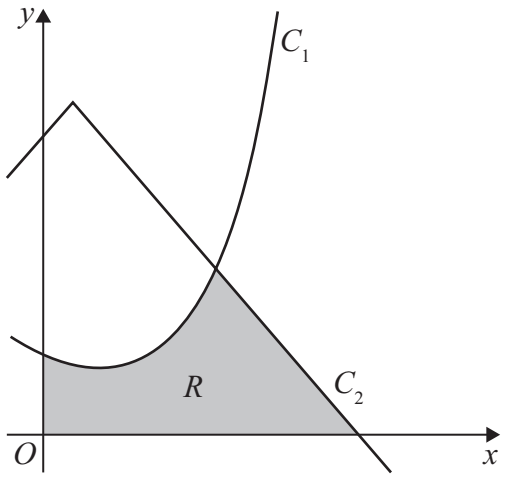


Figure 2

In this question you must show all stages of your working.
Solutions relying entirely on calculator technology are not acceptable.

(a) Find $\int\left(\frac{11}{2x+5}+4e^{x-3}\right)dx$

(2)

Figure 2 shows a sketch of part of the curve C_1 and part of the graph C_2
The curve C_1 has equation

$$y=\frac{11}{2x+5}+4e^{x-3}$$

The graph C_2 has equation

$$y=a-|bx-1|$$

where a and b are positive integers.

(b) State, in terms of a and/or b, the coordinates of the maximum point of C_2

(2)

Given that

- C_1 intersects C_2 at $x = 3$
- C_2 crosses the y-axis at (0, 9)

(c) find the value of a and the value of b

(3)

The region R, shown shaded in Figure 2, is bounded by C_1, C_2, the x-axis and the y-axis.

(d) Find the area of R, giving the answer to 3 significant figures.

(4)

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