6.

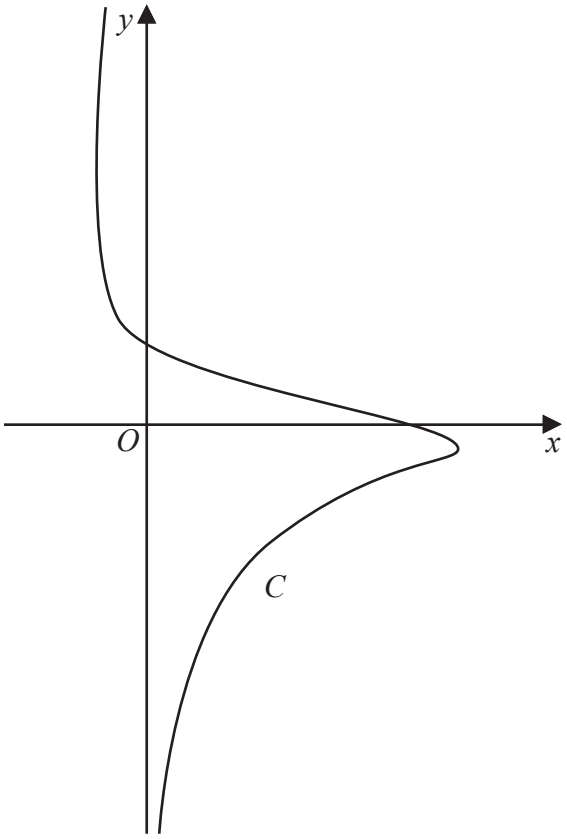


Figure 2

Figure 2 shows a sketch of the curve C with equation

$$4xy^2 + 12y + 6x = 53 \qquad y \in \mathbb{R}$$

(a) Use implicit differentiation to find $\frac{dy}{dx}$ in simplest form in terms of x and y.

(5)

The point $P(a, b)$ lies on C.

Given that a is the maximum possible value of x

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

(*Solutions relying on calculator technology are not acceptable.*)

(5)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 10 marks)

7. (i) Use integration by parts to find

$$\int e^{2x} \cos 4x \, dx$$

(6)

(ii) Using the substitution $2x = \sin u$ and algebraic integration, find the exact value of

$$\int_{\frac{1}{4}}^{\frac{\sqrt{3}}{4}} \frac{2x^3}{\sqrt{1-4x^2}} \, dx$$

giving the answer in simplest form.

(*Solutions relying on calculator technology are not acceptable.*)

(7)

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