4. (a) Using the substitution $u = \sqrt{2x+1}$, show that

$$\int_4^{12} \sqrt{8x+4}\ e^{\sqrt{2x+1}}\ dx$$

may be expressed in the form

$$\int_a^b ku^2 e^u\ du$$

where a, b and k are constants to be found.

(4)

(b) Hence find, by algebraic integration, the exact value of

$$\int_4^{12} \sqrt{8x+4}\ e^{\sqrt{2x+1}}\ dx$$

giving your answer in simplest form.

(5)

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Question 4 continued

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Question 4 continued

(Total for Question 4 is 9 marks)

5.

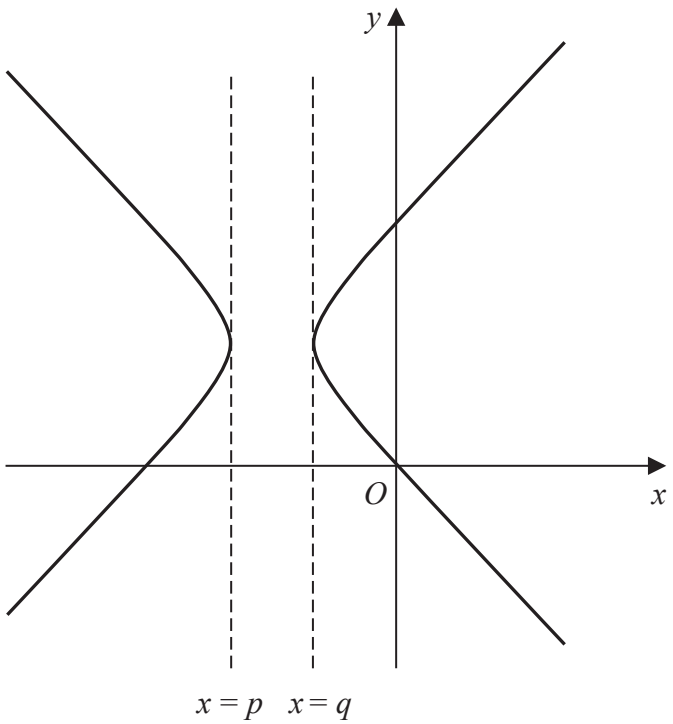


Figure 2

Figure 2 shows a sketch of the curve with equation

$$y^2 = 2x^2 + 15x + 10y$$

(a) Find $\frac{dy}{dx}$ in terms of x and y.

(4)

The curve is not defined for values of x in the interval (p, q), as shown in Figure 2.

(b) Using your answer to part (a) or otherwise, find the value of p and the value of q.

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

(3)

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