7. **In this question you must show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

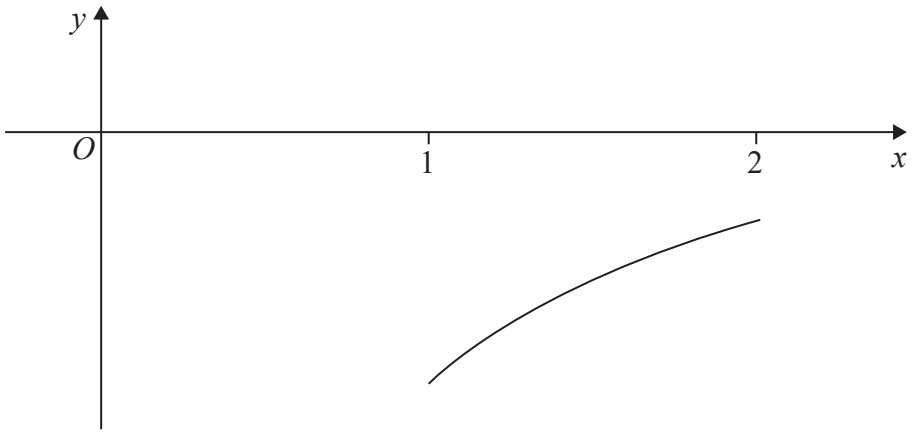


Figure 1

Figure 1 shows the curve with equation

$$y = \ln\left(\tanh\frac{x}{2}\right) \qquad 1 \leqslant x \leqslant 2$$

(a) Show that the length, s, of the curve is given by

$$s = \int_1^2 \coth x \, \mathrm{d}x$$

(4)

(b) Hence show that

$$s = \ln\left(\mathrm{e} + \frac{1}{\mathrm{e}}\right)$$

(4)

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Question 7 continued

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Question 7 continued

(Total for Question 7 is 8 marks)