2 **(a)** Starting from the definitions of tanh and sech in terms of exponentials, prove that

$$\tanh^2 t + \operatorname{sech}^2 t = 1.$$ [3]

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(b) The curve C has parametric equations

$$x = \ln(\cosh t), \quad y = \tan^{-1}(\sinh t), \quad \text{for } 0 \leqslant t \leqslant 1.$$

Find the length of C. [5]

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