Further Pure Core – Hyperbolic Functions

Patrons are reminded that the hyperbolic functions are defined thus:

$$\cosh x \equiv \frac{e^x + e^{-x}}{2}, \qquad \sinh x \equiv \frac{e^x - e^{-x}}{2}, \qquad \tanh x \equiv \frac{\sinh x}{\cosh x} \equiv \frac{e^x - e^{-x}}{e^x + e^{-x}}.$$

Most questions are taken from old OCR Further Pure 2 papers.

1. (a) Using the definitions of $\sinh x$ and $\cosh x$ in terms of e^x and e^{-x}, prove that $\sinh 2x = 2\sinh x \cosh x$.

   (b) Show that the curve with equation $y = \cosh 2x - 6\sinh x$ has just one stationary point, and find its x-coordinate in logarithmic form. Determine the nature of the stationary point. [OCR]