4. (a) Use the definitions of hyperbolic functions in terms of exponentials to show that

$$\sinh(A + B) \equiv \sinh A \cosh B + \cosh A \sinh B$$

(3)

(b) Hence express $10\sinh x + 8\cosh x$ in the form $R\sinh(x + \alpha)$ where $R > 0$, giving α in the form $\ln p$ where p is an integer.

(4)

(c) Hence solve the equation

$$10\sinh x + 8\cosh x = 18\sqrt{7}$$

giving your answer in the form $\ln\left(\sqrt{7} + q\right)$ where q is a rational number to be determined.

(2)

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Question 4 continued

(Total for Question 4 is 9 marks)