

Question 1

Differentiate the function:

$$f(x) = \sinh(x) \cdot \cosh(x)$$

Then express your answer in terms of a single hyperbolic function if possible.

Question 1 - Solution

We are given:

$$f(x) = \sinh(x) \cdot \cosh(x)$$

Use the product rule:

$$f'(x) = \cosh(x) \cdot \cosh(x) + \sinh(x) \cdot \sinh(x) = \cosh^2(x) + \sinh^2(x)$$

Recall the identity:

$$\cosh^2(x) - \sinh^2(x) = 1 \quad \Rightarrow \quad \cosh^2(x) + \sinh^2(x) = 2\cosh^2(x) - 1$$

Thus:

$$f'(x) = \boxed{\cosh^2(x) + \sinh^2(x) = 2\cosh^2(x) - 1}$$

Answer: $f'(x) = \boxed{\cosh(2x)}$