

Solution .

$$2\text{Sh } \ln \frac{5}{2} = e^{\ln \frac{5}{2}} - e^{-\ln \frac{5}{2}} = \frac{5}{2} - \frac{2}{5} = \frac{21}{10},$$

$$2\text{Ch } (3 \ln \frac{5}{2}) = \text{Ch } \ln \frac{125}{8} = \frac{1}{2} \left(\frac{125}{8} + \frac{8}{125} \right) = \frac{15689}{2000}$$

$$\text{Ch } \ln \frac{5}{2} = \frac{1}{2} \left(\frac{5}{2} + \frac{2}{5} \right) \frac{29}{20}, \text{Sh } \ln \frac{5}{2} = \frac{21}{20} \Rightarrow \text{Th } \ln \frac{5}{2} = \frac{21}{29},$$

$$\text{F } (\ln \frac{5}{2}) = \frac{29}{21} \frac{15689-4200}{2000} = \frac{29}{21} \frac{11489}{2000}$$

Example 3 Write the sum (product) as product (sum) form:

$$\text{a) Ch } 4 + \text{Ch } 12 \qquad \text{b) Sh } \ln 3 \cdot \text{Sh } \ln 6$$

Solution .

$$\text{a) Ch } 4 + \text{Ch } 12 = 2 \text{Ch } 8 \text{Ch } 4$$

$$\text{b) Sh } \ln 3 - \text{Sh } \ln 6 = \frac{1}{2} (\text{Ch}(\ln 3 + \ln 6) - \text{Ch}(\ln 6 - \ln 3))$$

$$= \frac{1}{2} (\text{Ch } \ln 18 - \text{Ch } \ln 2)$$

Example 4 Express Ch 30, Sh 30 in terms of Ch 0 and Sh 0.

Solution .

$$\text{Ch } 30 + \text{Sh } 30 = (\text{Ch } 0 + \text{Sh } 0)^3 = \text{Ch}^3 0 + 3\text{Ch}^2 0 \text{Sh } 0 + 3 \text{Ch } 0 \text{Sh}^2 0 + \text{Sh}^3 0$$

$$\text{Ch } 30 = 3 \text{Ch}^3 0 + 3 \text{Ch } 0 \text{Sh}^2 0$$

$$\text{Sh } 30 = 3 \text{Ch}^2 0 \text{Sh } 0 + \text{Sh}^3 0$$

B. Derivatives, Integrals and Graphs

We write down the hyperbolic functions in argument x together with their domains and ranges:

<u>Functions</u>	<u>Domain</u>	<u>Range</u> ¹
Cosh x = $\frac{e^x + e^{-x}}{2}$	$(-\infty, \infty)$	$(1, \infty)$

¹More conveniently obtainable from the graphs.