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문제 5.4.1)

$$\cosh(x+y) = \cosh x \cosh y + \sinh x \sinh y \text{ 임을 보라.}$$

sol)

$$\cosh x = \frac{e^x + e^{-x}}{2}$$

$$\cosh(x+y) = \frac{e^{x+y} + e^{-(x+y)}}{2} = \frac{e^x e^y + e^{-x} e^{-y}}{2}$$

$$\cosh x \cosh y + \sinh x \sinh y = \frac{e^x e^y + e^{-x} e^{-y}}{2}$$

$$\cosh(x+y) = \frac{e^x e^y + e^{-x} e^{-y}}{2}$$

위항 두항이 같으므로 성립한다.

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$$2. \lim_{x \rightarrow \infty} \frac{\sinh x}{e^x} \text{ 을 구하라.}$$

sol)

$$\sinh x = \frac{e^x - e^{-x}}{2}$$

$$\lim_{x \rightarrow \infty} \frac{e^x - e^{-x}}{2e^x} = \lim_{x \rightarrow \infty} \frac{e^x e^x - e^{-x} e^x}{2e^{2x}}$$

$$= \lim_{x \rightarrow \infty} \frac{1}{2} - \frac{1}{e^x}$$

$$= \frac{1}{2}$$

3.

$$(1) y = \ln \tanh(3x+1)$$

sol)

$$y' = \frac{1}{\tanh(3x+1)} \operatorname{sech}^2(3x+1) \times 3$$

$$= \frac{3 \operatorname{sech}^2(3x+1)}{\tanh(3x+1)}$$