

Calculus I, Section 3.11, #16
Hyperbolic Functions

*Prove the identity.*¹

$$\cosh(2x) = \cosh^2(x) + \sinh^2(x)$$

We know

$$\cosh(x + y) = \cosh(x) \cosh(y) + \sinh(x) \sinh(y)$$

and if we think of $y = x$ we get

$$\begin{aligned}\cosh(x + x) &= \cosh(x) \cosh(x) + \sinh(x) \sinh(x) \\ \cosh(2x) &= \cosh^2(x) + \sinh^2(x)\end{aligned}$$

(Yep, that's it.)

¹Stewart, *Calculus, Early Transcendentals*, p. 264, #16.