

Formulaire de Trigonométrie hyperbolique

Relation «de Riccati-Lambert»

$$\operatorname{ch}^2(a) - \operatorname{sh}^2(a) = 1$$

Formules de transformations

$$\textit{Parité} \quad \operatorname{ch}(-a) = \operatorname{ch}(a) \quad \operatorname{sh}(-a) = -\operatorname{sh}(a) \quad \operatorname{th}(-a) = -\operatorname{th}(a)$$

Formules d'addition

$$\operatorname{ch}(a+b) = \operatorname{ch}(a)\operatorname{ch}(b) + \operatorname{sh}(a)\operatorname{sh}(b) \quad \operatorname{ch}(a-b) = \operatorname{ch}(a)\operatorname{ch}(b) - \operatorname{sh}(a)\operatorname{sh}(b)$$

$$\operatorname{sh}(a+b) = \operatorname{sh}(a)\operatorname{ch}(b) + \operatorname{sh}(b)\operatorname{ch}(a) \quad \operatorname{sh}(a-b) = \operatorname{sh}(a)\operatorname{ch}(b) - \operatorname{sh}(b)\operatorname{ch}(a)$$

$$\operatorname{th}(a+b) = \frac{\operatorname{th}(a) + \operatorname{th}(b)}{1 + \operatorname{th}(a)\operatorname{th}(b)} \quad \operatorname{th}(a-b) = \frac{\operatorname{th}(a) - \operatorname{th}(b)}{1 - \operatorname{th}(a)\operatorname{th}(b)}$$

Formules de duplication

$$\operatorname{ch}(2a) = \operatorname{ch}^2(a) + \operatorname{sh}^2(a) = 2\operatorname{ch}^2(a) - 1 = 1 + 2\operatorname{sh}^2(a)$$

$$\operatorname{sh}(2a) = 2\operatorname{sh}(a)\operatorname{ch}(a)$$

$$\operatorname{th}(2a) = \frac{2\operatorname{th}(a)}{1 + \operatorname{th}^2(a)}$$

Formules de l'angle moitié

Si $\theta \in \mathbb{R}$ on pose $t = \operatorname{th}(\theta/2)$. Alors :

$$\operatorname{ch}(\theta) = \frac{1+t^2}{1-t^2} \quad \operatorname{sh}(\theta) = \frac{2t}{1-t^2} \quad \operatorname{th}(\theta) = \frac{2t}{1+t^2}$$

Formules de linéarisation

$$\operatorname{ch}(a)\operatorname{ch}(b) = \frac{\operatorname{ch}(a+b) + \operatorname{ch}(a-b)}{2} \quad \operatorname{sh}(a)\operatorname{sh}(b) = \frac{\operatorname{ch}(a+b) - \operatorname{ch}(a-b)}{2}$$

$$\operatorname{sh}(a)\operatorname{ch}(b) = \frac{\operatorname{sh}(a+b) + \operatorname{sh}(a-b)}{2}$$

$$\text{En particulier : } \operatorname{ch}^2(a) = \frac{\operatorname{ch}(2a) + 1}{2} \quad \operatorname{sh}^2(a) = \frac{\operatorname{ch}(2a) - 1}{2}$$