

Hyperbolické Funkce

MB202

Jaro 2015

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$\sinh(x)$

$$\sinh(x) = \frac{e^x - e^{-x}}{2} = \frac{e^{2x} - 1}{2e^x}$$

$$D(\sinh) = \mathbf{R}$$

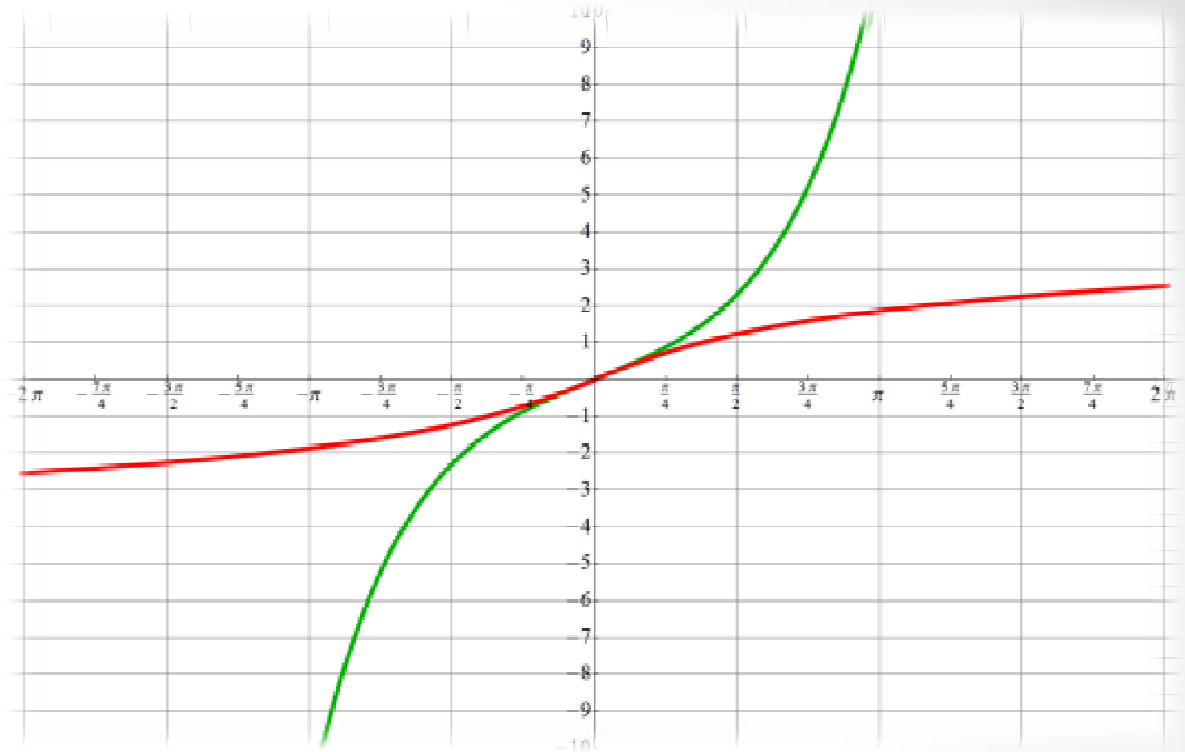
$$H(\sinh) = \mathbf{R}$$

$\operatorname{argsinh}(x)$

$$\operatorname{argsinh}(x) = \ln(x + \sqrt{x^2 + 1})$$

$$D(\operatorname{argsinh}) = \mathbf{R}$$

$$H(\operatorname{argsinh}) = \mathbf{R}$$



cosh(x)

$$\cosh(x) = \frac{e^x + e^{-x}}{2} = \frac{e^{2x} - 1}{2e^x}$$

$$D(\cosh) = \mathbf{R}$$

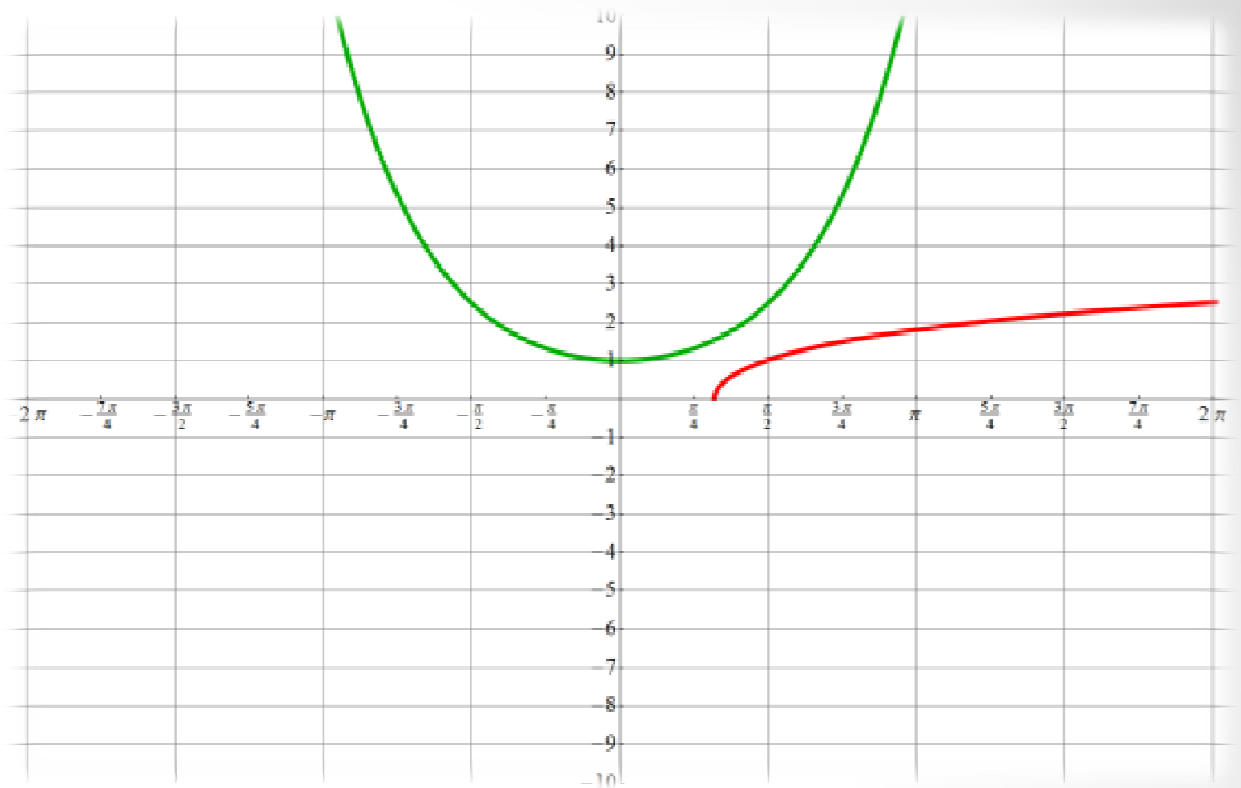
$$H(\cosh) = \langle 1, \square \rangle$$

argcosh(x)

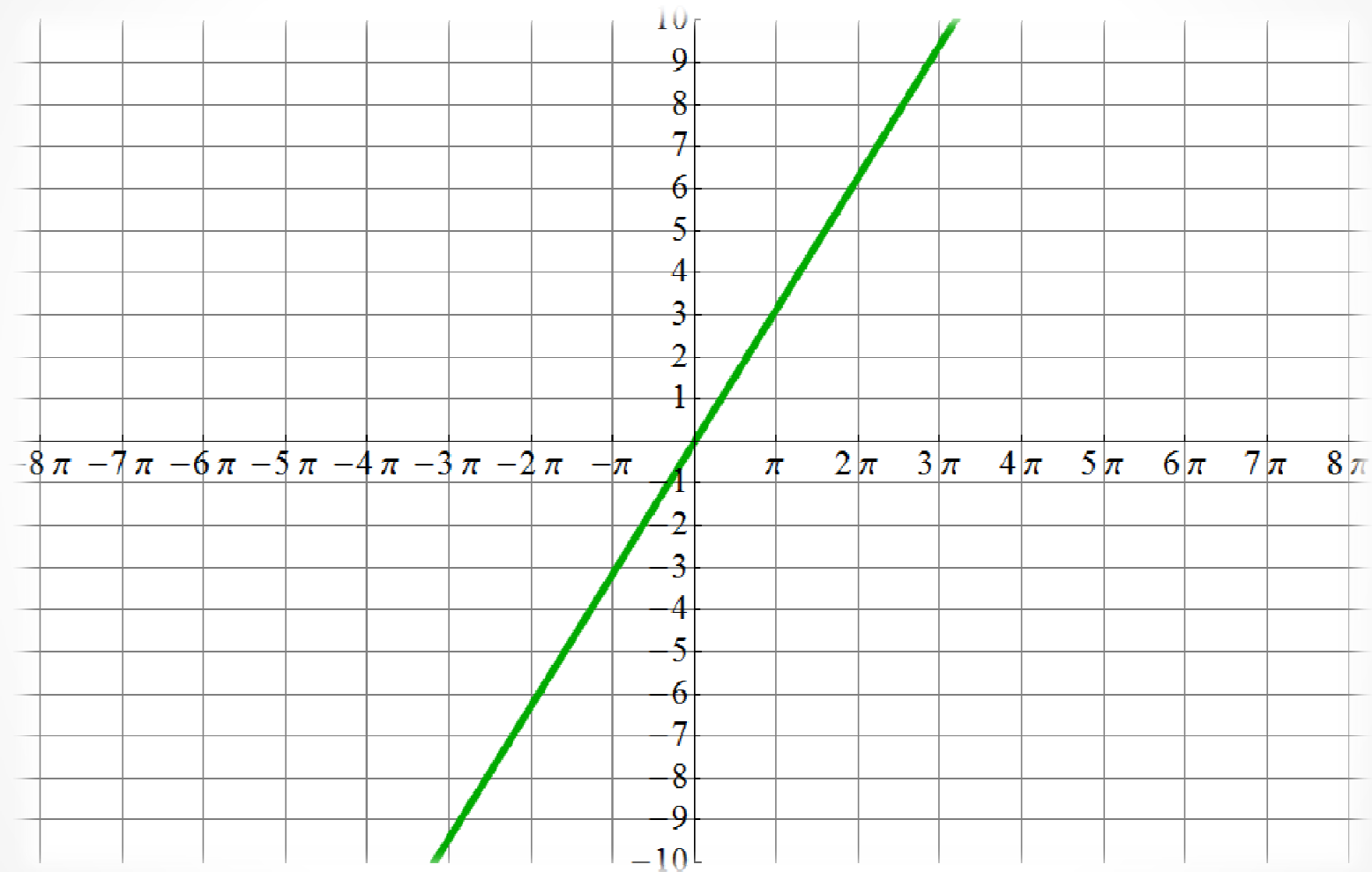
$$\operatorname{argcosh}(x) = \ln(x + \sqrt{x^2 - 1})$$

$$D(\operatorname{argcosh}) = \langle 1, \square \rangle$$

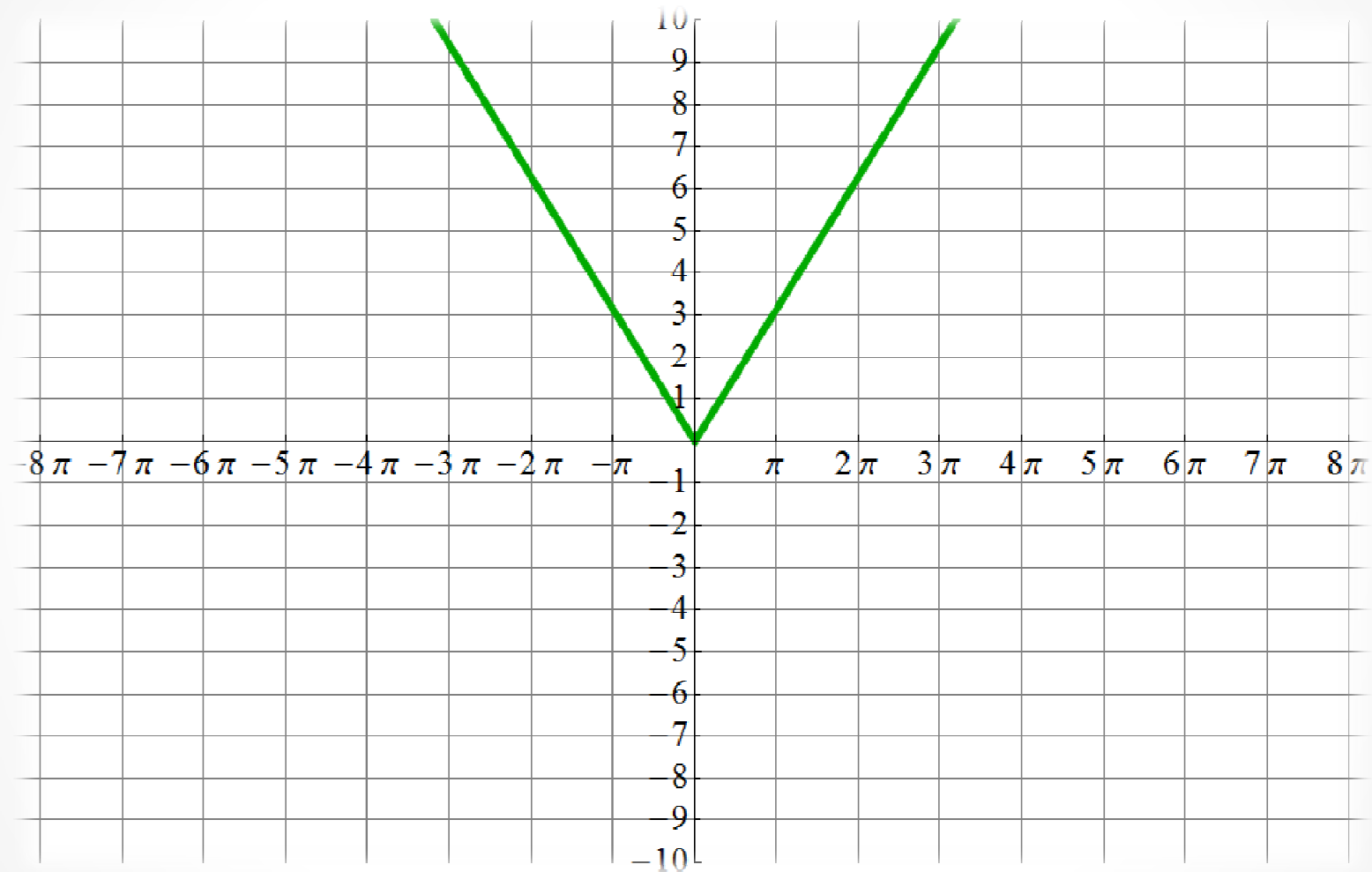
$$H(\operatorname{argcosh}) = \langle 0, \square \rangle$$



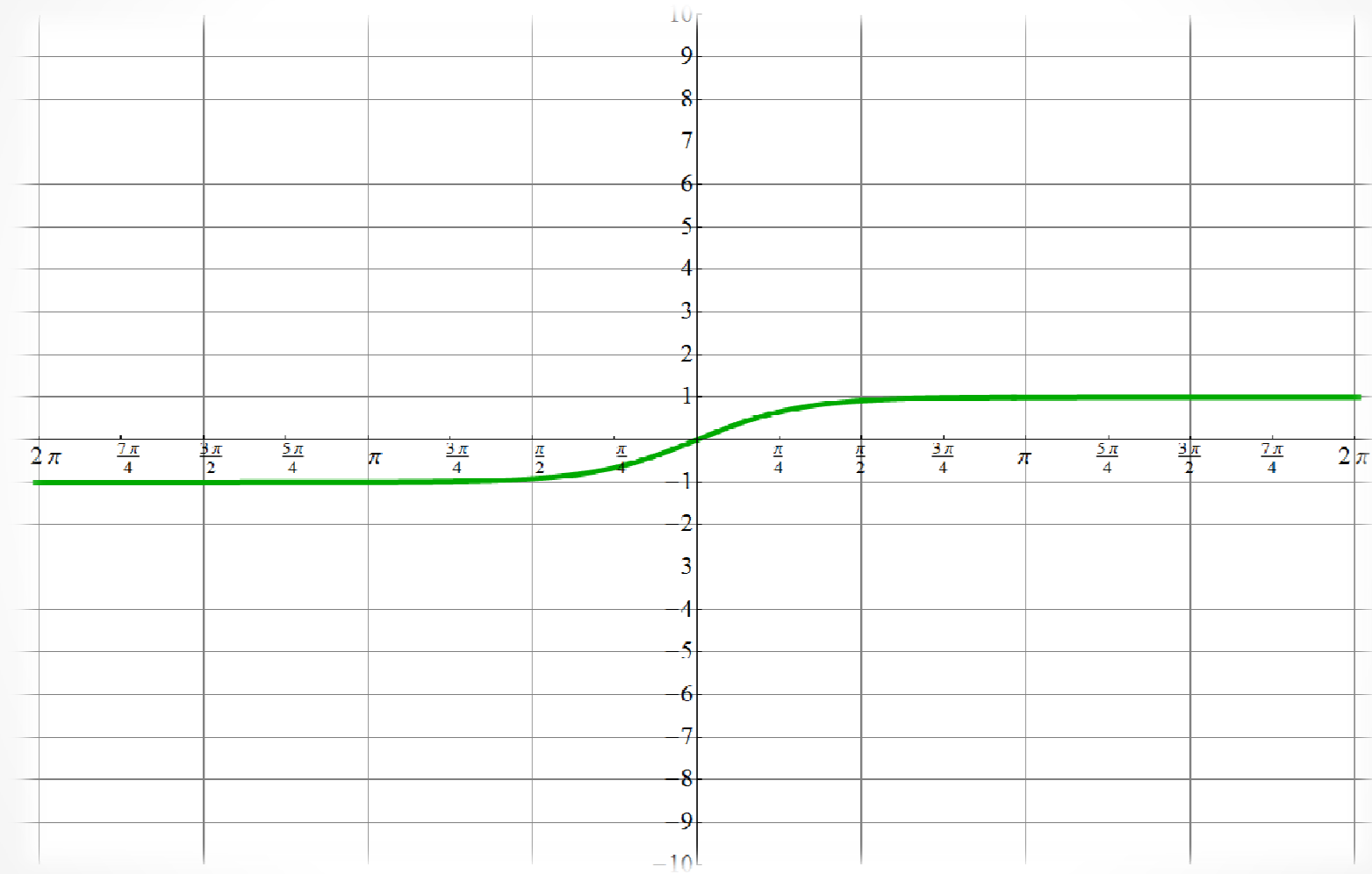
$\operatorname{argsinh}(\sinh(x))$



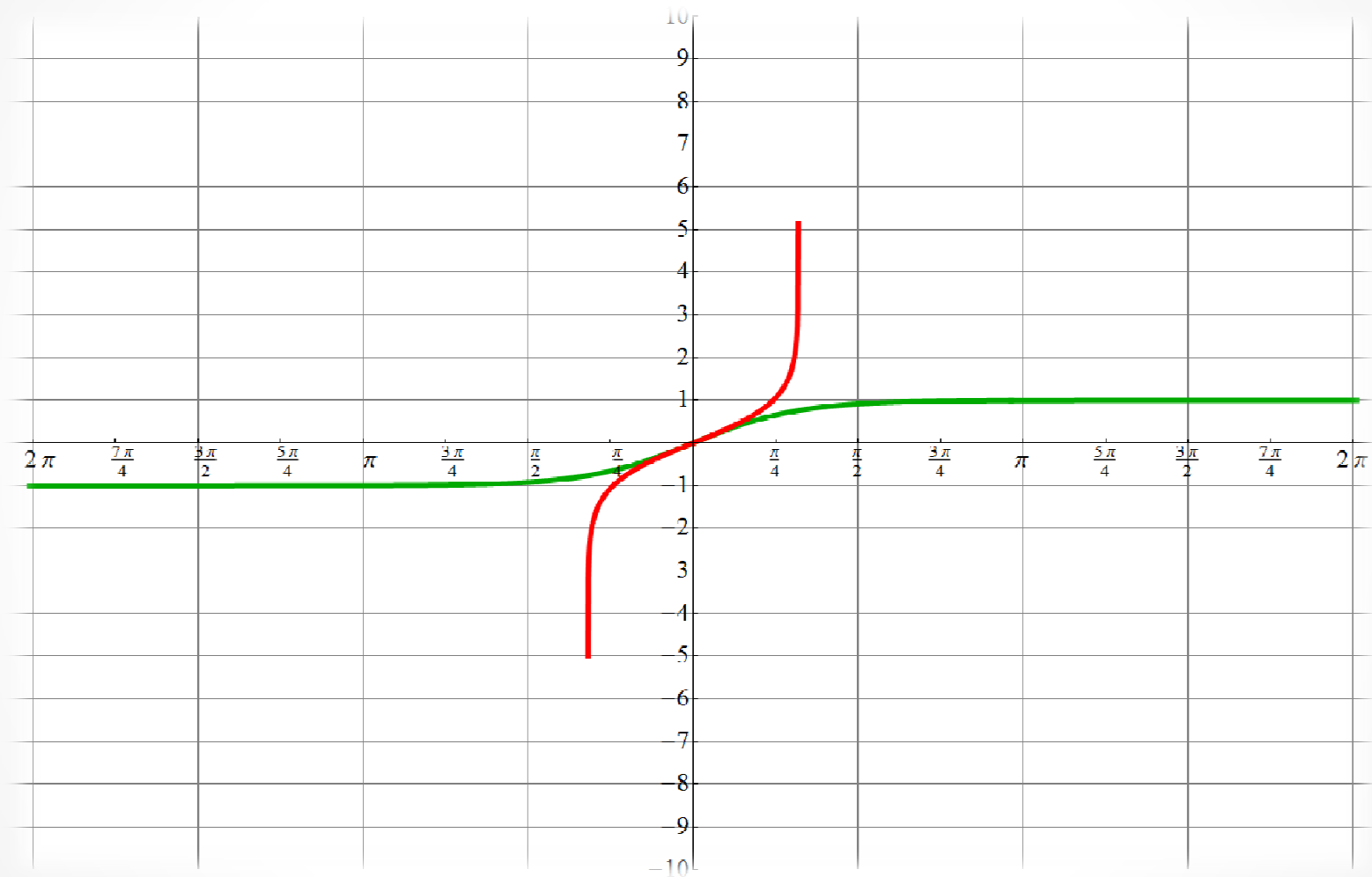
$\operatorname{argcosh}(\cosh(x))$



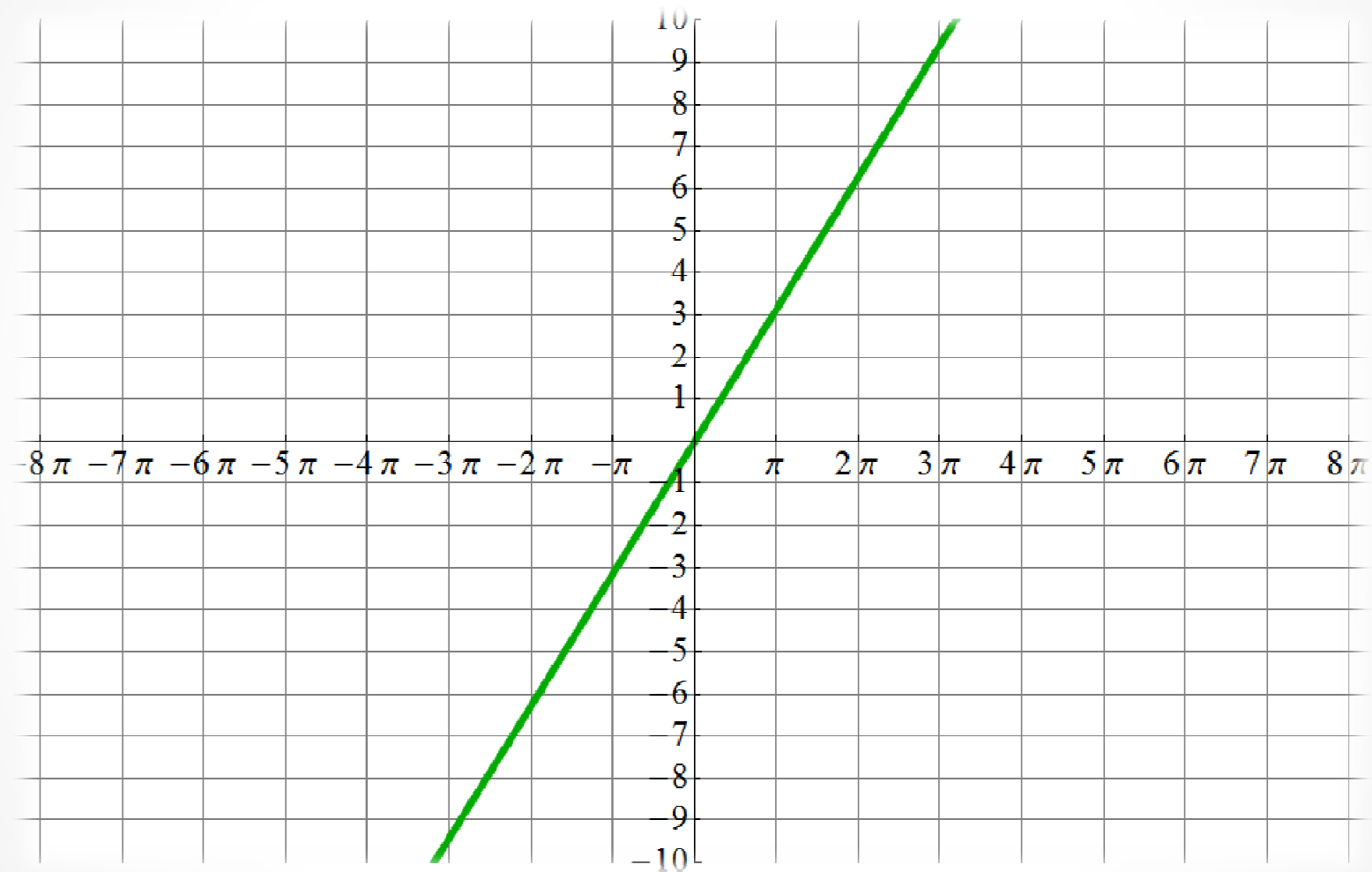
tgh(x)



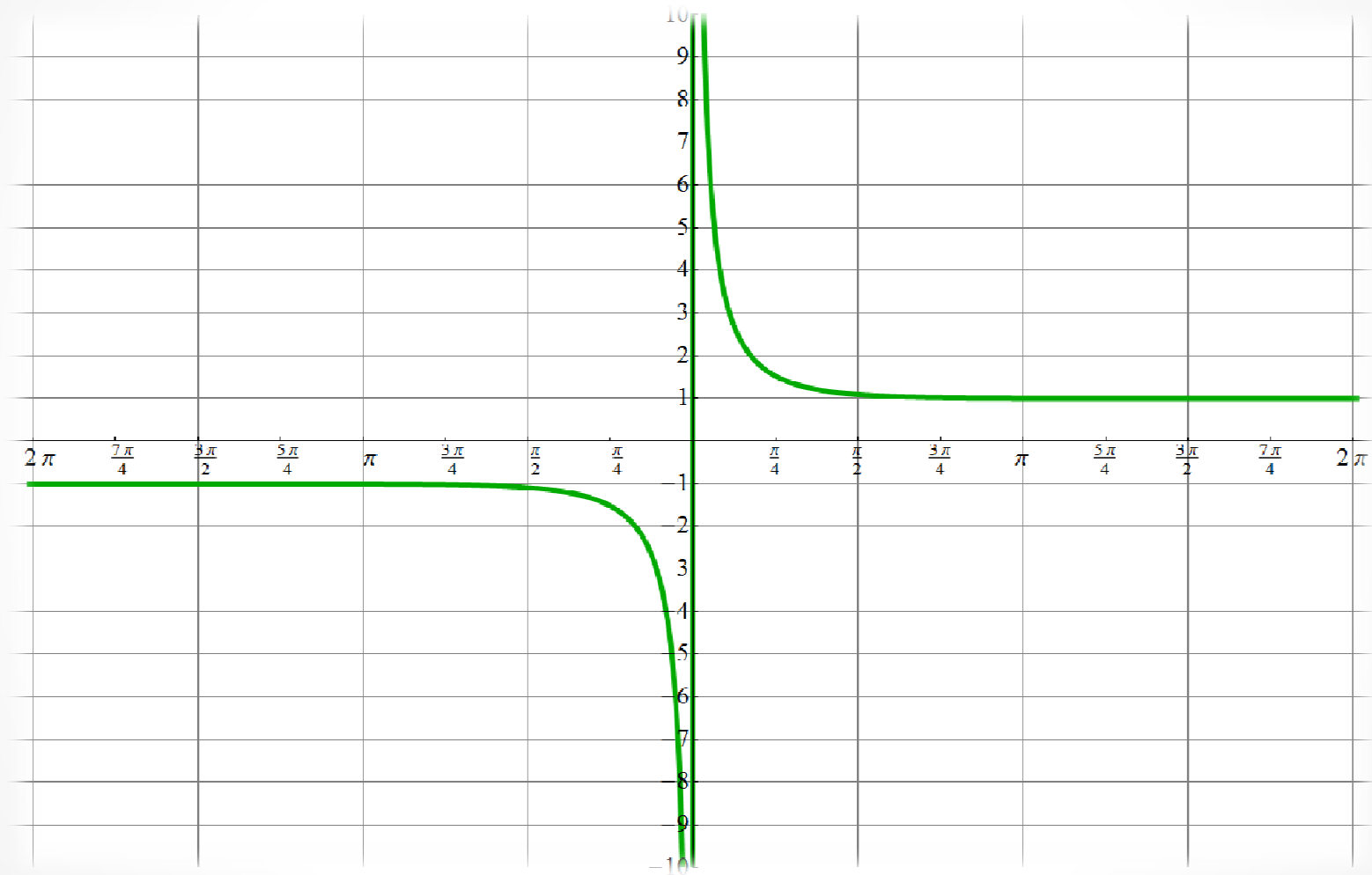
tgh(x) argtgh(x)



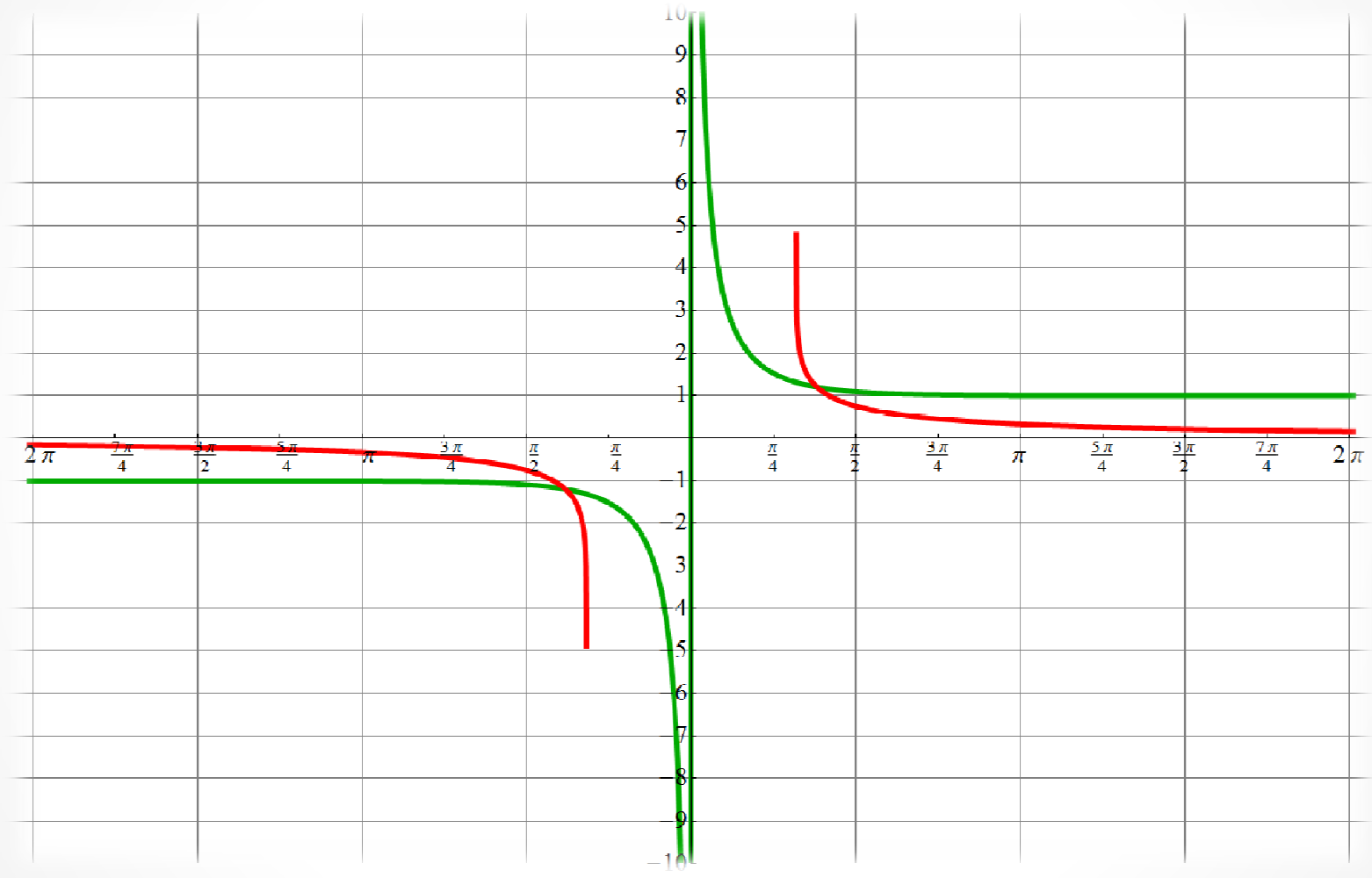
$\operatorname{argtgh}(\operatorname{tgh}(x))$



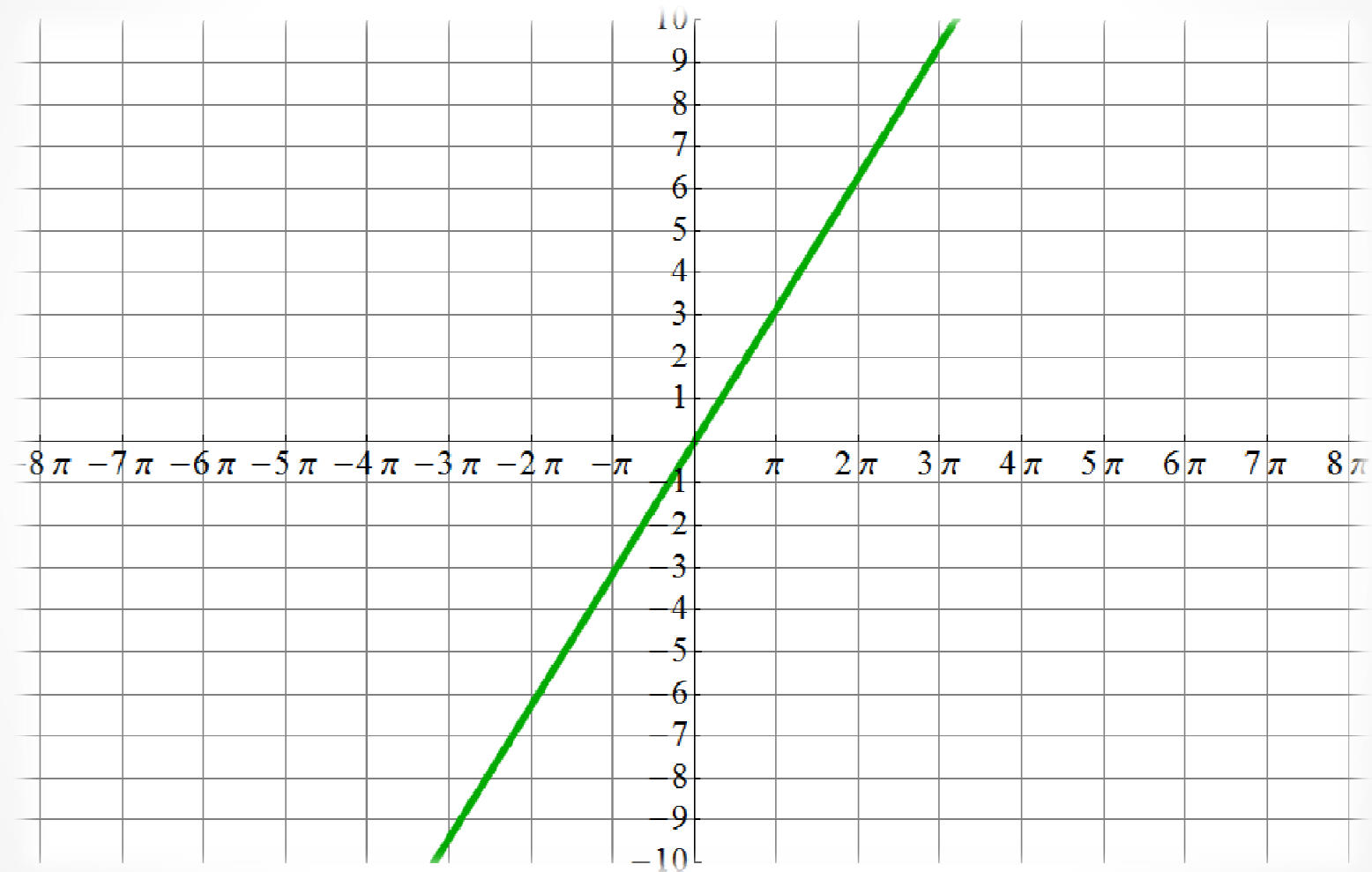
$\coth(x)$



$\coth(x)$ $\operatorname{argcoth}(x)$



$\operatorname{argcoth}(\operatorname{coth}(x))$



vzorečky

$$\sinh(\mathbf{x} \pm \mathbf{y}) = \sinh(\mathbf{x}) \cosh(\mathbf{y}) \pm \cosh(\mathbf{x}) \sinh(\mathbf{y})$$

$$\cosh(\mathbf{x} \pm \mathbf{y}) = \cosh(\mathbf{x}) \cosh(\mathbf{y}) \pm \sinh(\mathbf{x}) \sinh(\mathbf{y})$$

$$\sinh(2\mathbf{x}) = 2 \sinh(\mathbf{x}) \cosh(\mathbf{x})$$

$$\cosh(2\mathbf{x}) = \cosh^2(\mathbf{x}) + \sinh^2(\mathbf{x})$$

$$\sinh^2(\mathbf{x}) = \frac{1}{2}(\cosh(2\mathbf{x}) - 1)$$

$$\cosh^2(\mathbf{x}) = \frac{1}{2}(\cosh(2\mathbf{x}) + 1)$$

$$\cosh^2(\mathbf{x}) - \sinh^2(\mathbf{x}) = 1$$

$$\mathbf{tgh}(\mathbf{x} \pm \mathbf{y}) = \frac{\mathbf{tgh}(\mathbf{x}) \pm \mathbf{tgh}(\mathbf{y})}{1 \pm \mathbf{tgh}(\mathbf{x})\mathbf{tgh}(\mathbf{y})}$$

$$\mathbf{tgh}(2\mathbf{x}) = \frac{2\mathbf{tgh}(\mathbf{x})}{1 + \mathbf{tgh}^2(\mathbf{x})}$$

vztah k sin/cos

$$\sinh(x) = -i \sin(ix)$$

$$\cosh(x) = \cos(ix)$$

$$\operatorname{tgh}(x) = -i \operatorname{tg}(ix)$$

$$\operatorname{coth}(x) = i \operatorname{cot}(ix)$$

užití

- řetězovka
- fyzika
- tractrix

