Hyperbolas Q1 [Practice/E](26/5/21)

Show that the equation of the tangent to the hyperbola

$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at the point $(acosht, bsinht)$ is

$yasinht = xbcosht - ab$

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Solution

Using the parametric equations $x = acosht$ & $y = bsinht$,

$\frac{dx}{dt} = asinht$ & $\frac{dy}{dt} = bcosht$,

so that $\frac{dy}{dx} = \frac{bcosht}{asinht}$

and the equation of the tangent at $(acosht, bsinht)$ is

$\frac{y-bsinht}{x-acosht} = \frac{bcosht}{asinht}$

and hence $yasinht - absinh^2t = xbcosht - abcosh^2t$,

so that $yasinht = xbcosht - ab$