**Colorado Technical University**

 **Course:** MATH207 – Integral Calculus

**Unit 2 Part 3 Readings: Hyperbolic Functions**

**Hyperbolic Functions**

Hyperbolic functions are analogues of the ordinary trigonometric functions, but defined using \ the hyperbola rather than the circle

Just as the points (cos(t), sin(t)) form a circle with a unit radius, the points (cosh(t), sinh(t))

form the right half of the unit hyperbola

Just as the slopes of sin(t) and cos(t) are cos(t) and -sin(t), the slopes of sinh(t) and cosh(t) are

cosh(t) and +sinh(t)

Hyperbola

The hyperbolics can be defined in different ways:

in terms of exponentials: sinh(x) = (ex – e-x)/2

cosh(x) = (ex + e-x)/2

tanh(x) = (ex - e-x)/(ex + e-x)

in terms of complex trig functions: sinh(x) = - *i* sin(*i* x)

cosh(x) = cos(*i*x)

tanh(x) = -*i* (tan(*i* x)

If hyperbolics are being defined as exponentials, their inverses will be logarithms:

sinh-1(x) = ln(x+$\sqrt{x2+1}$)

cosh-1(x) = ln(x+$\sqrt{x2-1}$)

tanh-1(x) = ½ln$\left(\frac{1+x}{1-x}\right)$

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