Hyperbolic functions arose from looking at the area under a hyperbolic curve. They are commonly used when dealing with curves that are catenary, curves created by hanging a rope/cable which is supported only at its two ends. Some examples of catenary curves are a jump rope, the support cables on the golden gate bridge, & the St. Louis Arch.

[](http://images.google.com/imgres?imgurl=http://www.mainepuzzles.com/Images/Childrens-Wooden-Puzzles/7100_Small_Golden_Gate_Bridge_Wlooden_3D_Puzzle_lg.jpg&imgrefurl=http://www.mainepuzzles.com/Puzzles/Golden-Gate-Bridge-3D-Wooden-Puzzle-Small__7100.aspx&usg=__j9OlSQnGla8d1R0z2FNiIAZCfSI=&h=353&w=500&sz=23&hl=en&start=113&um=1&tbnid=tdLvnCCQ6NyTAM:&tbnh=92&tbnw=130&prev=/images?q=golden+gate+bridge+images&ndsp=20&hl=en&rls=com.microsoft:en-us&sa=N&start=100&um=1)

Ordinate \Or"di\*nate\, n. (Geom.)

The distance of any point in a curve or a straight line,

measured on a line called the axis of ordinates or on a line

parallel to it, from another line called the axis of

abscissas, on which the corresponding abscissa of the point

is measured.

Note: The ordinate and abscissa, taken together, are called

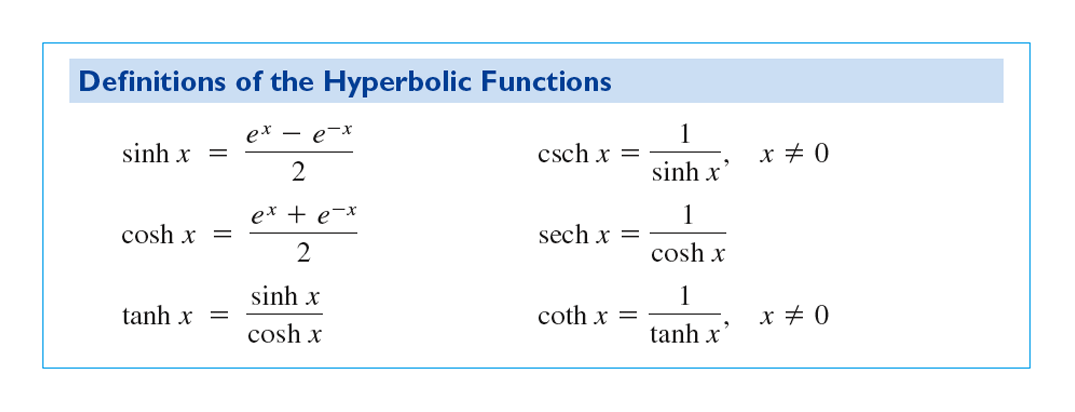
co["o]rdinates, and define the position of the point

with reference to the two axes named, the intersection

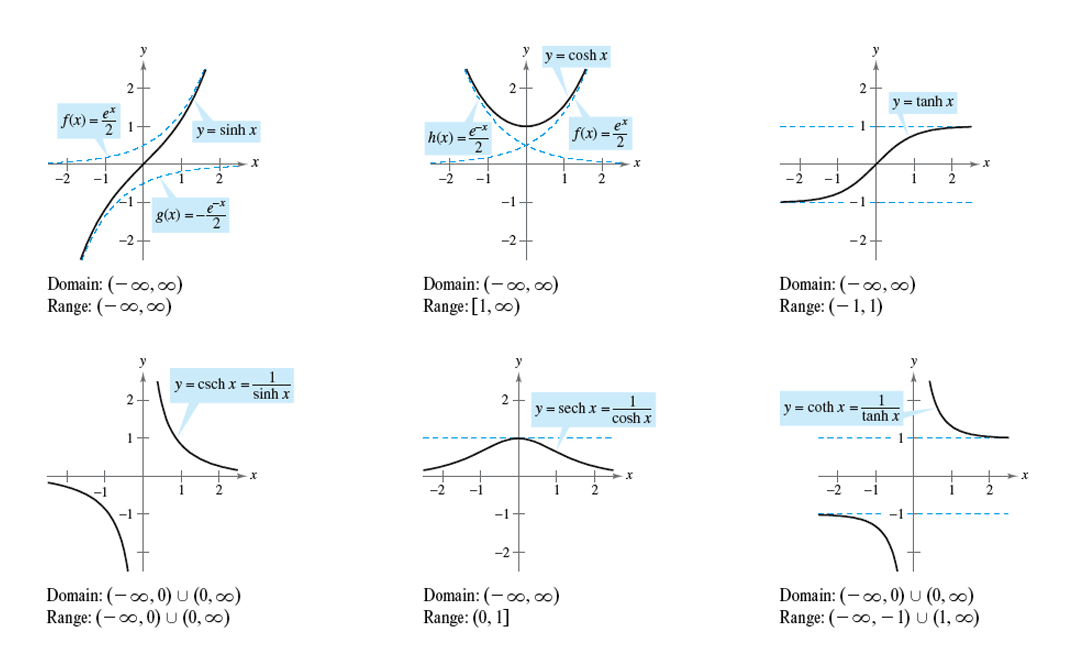
of which is called the origin of co["o]rdinates. See

Coordinate.

We now define the Hyperbolic Functions below.

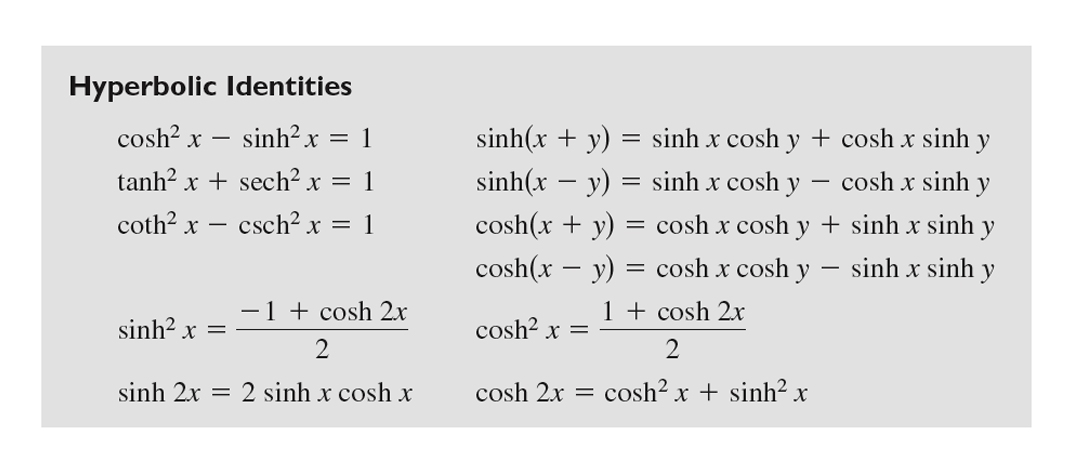
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And their graphs are given below. Notice that the graph of Sinh(x) can be obtained by addition of ordinates using the exponential functions and . Like wise for Cosh(x) for and .



Many of the identities of the hyperbolic trig. Functions have a corresponding identity.

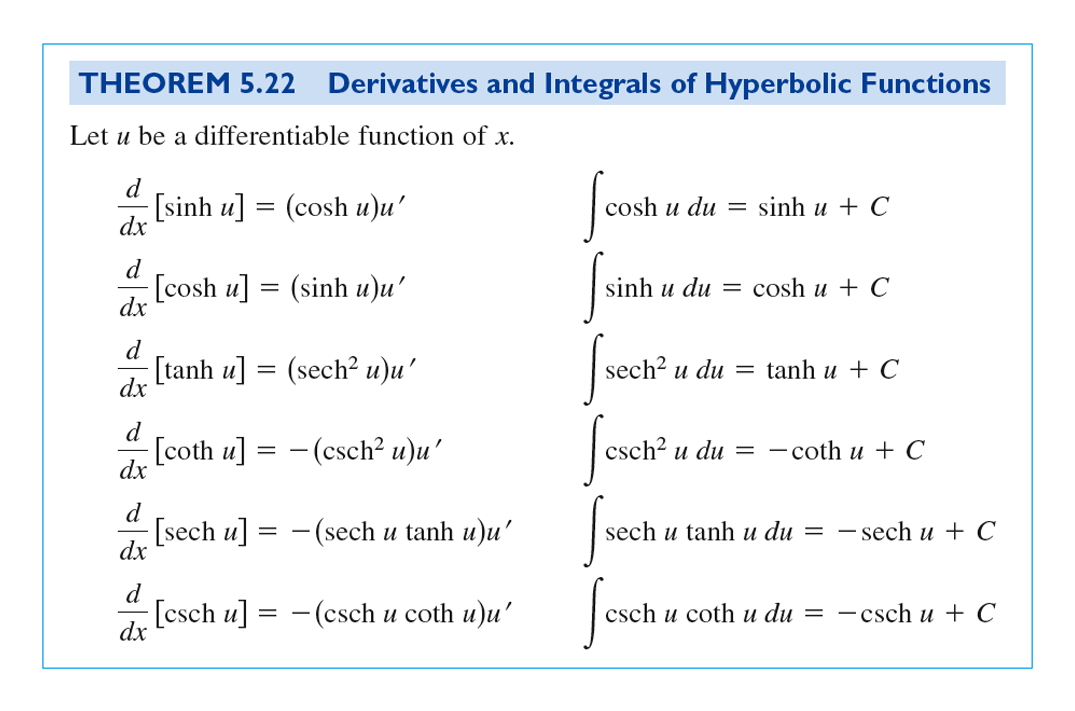
Ex:



Ex: 5.9.13 Use the value of the given hyperbolic function to find the values of the other hyperbolic functions at x. If .

Taking derivatives of the hyperbolic functions. This is as easy & difficult as taking the derivative of .

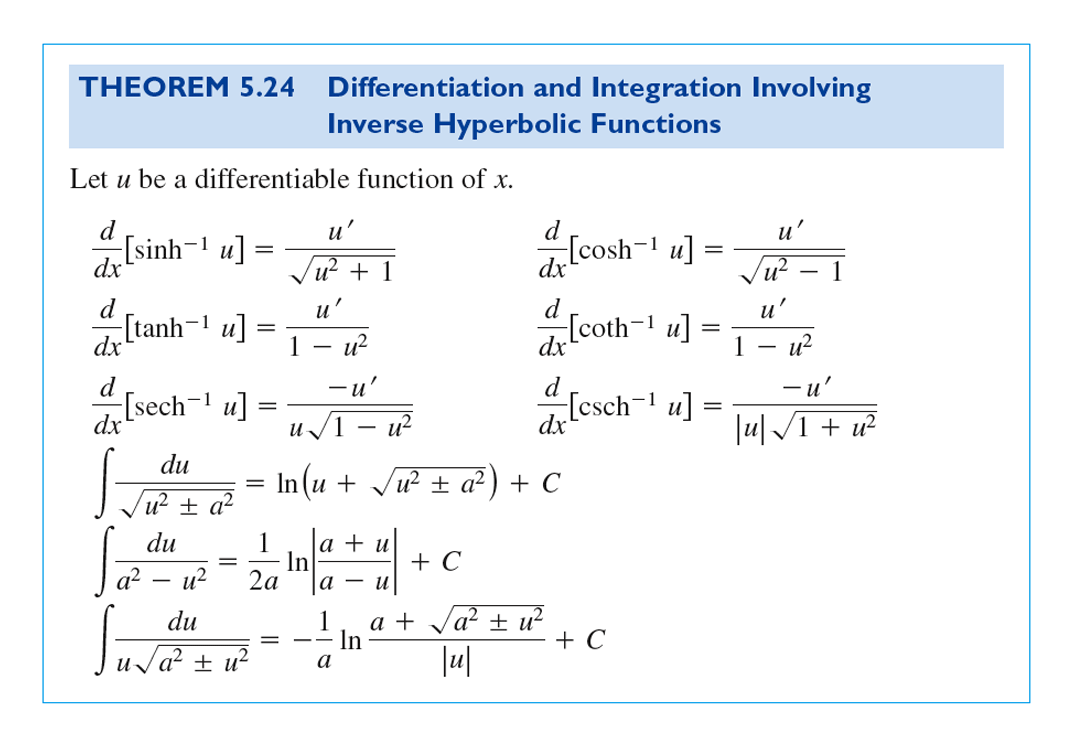
Ex: Find Ex: Find

The basic derivatives of the hyperbolic functions are given below.

Ex: 5.9.18 Find the derivative of

Ex: If , find . (Simplify your answer)

Similar to 5.9.33 T / F The function satisfies the differential equation

Some Inverse Hyperbolic Functions and their derivatives and integrals: