Trigonometric-Like Functions

Purpose: The purpose of this project is to introduce you to some functions which are similar to the trigonometric functions.

Procedure: You are to follow the steps below. You do not need to do the steps in exactly the order indicated as long as you cover everything you are asked to do. After completing the outline below you should write your results and calculations **neatly**. Be sure to include relevant graphs in what you turn in. Your grade will be determined in part by your presentation.

Project Outline:

1. Define $\mathrm{c}(x) = \frac{e^x+e^{-x}}{2}$ and $\mathrm{s}(x) = \frac{e^x-e^{-x}}{2}$. Think of these functions as playing the role of cos and sin and define the functions t, ct, sc, and cs which should play the roles of tan, cot, sec, and csc. Graph each and find the range and domain of each function.
2. Derive formulas corresponding to $\sin^2 x + \cos^2 x = 1$, $\tan^2 x + 1 = \sec^2 x$, and $\cot^2 x + 1 = \csc^2 x$ for the functions defined in Part 1. Graph the set of points of the form $(\mathrm{c}(t), \mathrm{s}(t))$ where $-10 < t < 10$ using Mathematica and relate the graph to one of the formulas you derived.
3. Derive formulas for s and c which correspond to the sum of two angle formulas of the trig functions.
4. Derive formulas for the inverse functions for s and c.