SOEN 6011 – Problem 1 Jesus Onofre Github account: https://github.com/jonofre21

Introduction: Function: sinh(x)

It is a basic hyperbolic function which is better expressed in terms of exponential function sinh, $z = {}^1\!/_2(e^z - e^{-z})$ picture taken from https://www.britannica.com/science/hyperbolic-functions.

This function represents a hyperbola, it could be like the trigonometric sin but sinh does not see any triangles but hyperbolas, these hyperbolic functions have an extended reputation on the physics filed, for example when "describing the shape of the curve formed by a high-voltage line suspended between two towers", example taken from https://www.britannica.com/science/hyperbolic-functions.

Domain: All the real numbers from -infinite to +infinite.
This function is an odd function, because for all and each value of x: sinh(-x) = -sinh(x)
This function is a continuous function because its derivate is greater than 0. Where the set (0,0) is the inflection point.

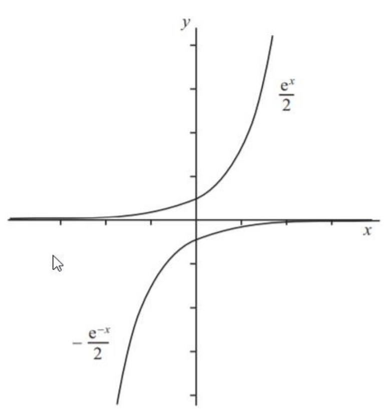
Co-domain: All the real numbers from – infinite to +infinite

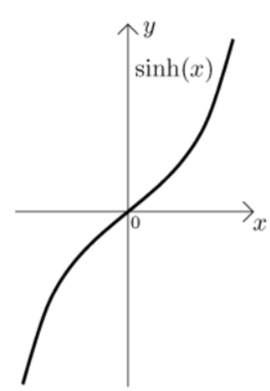
Characteristic of the function:

$\sinh x = \dfrac{e^x - e^{-x}}{2}.$ As per this formula we can infer for the resulting graph certain characteristics, for example, when x =0, e^x =1 and e^{-x} =1, so sinh 0 = 0
We can observe in the below graph 1 that when x gets larger, e^x increases quickly and e^{-x} decreases quickly.
When x is negative, - e^{-x} becomes large and negative very quickly, but e^x decreases very quickly.

Where it is used in the real world: As mentioned in the introduction this function is mostly used in the physics field, but it is used as well in mathematics, building engineering, etc.

Graph:





Graph 1 - Source:
http://www.mathcentre.ac.uk/resources/workbooks/mathcentre/hyperbolicfunctions.pdf

Graph 2 -Source: http://math.feld.cvut.cz/mt/txtb/4/txe3ba4f.htm