Assignment-2

Q1. Implementation of Exponential Series in Cortex –M4. Use the standard exponential series. In this we express e to the power of X as an infinite series.

The expression for calculating the exponential using infinite series is given as-

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots$$

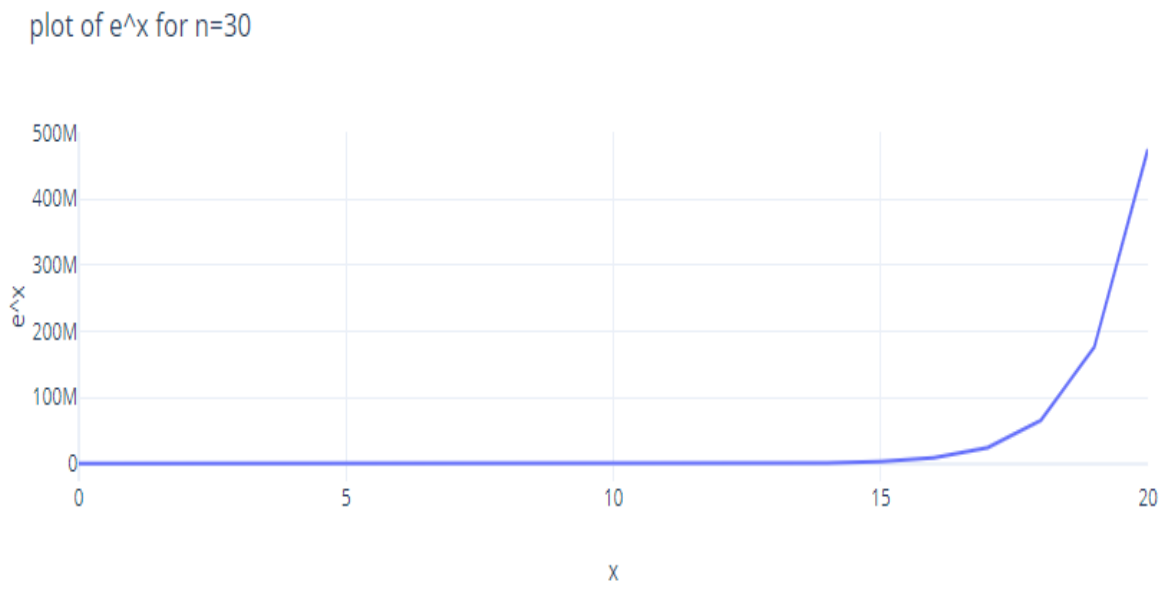
Let n = Number of terms in the series.

To implement this, I have used different loops to calculate factorial, powers of x, divide and addition.

The maximum value of X that the preogram can take is X=20.

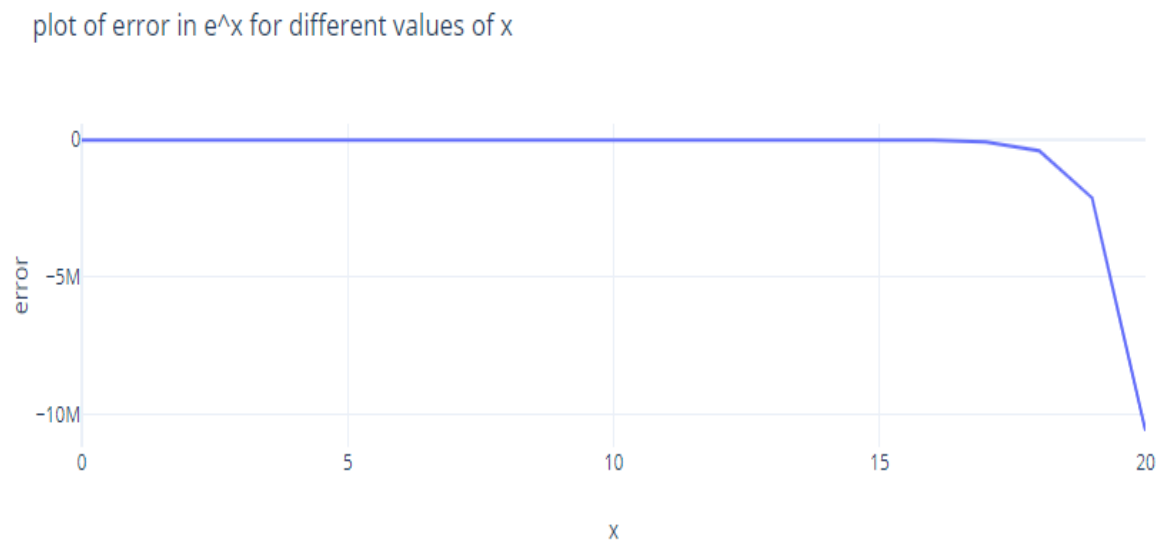
The maximum value of n that the preogram can take is n=30.

Plot of e^x for different values of x is shown below-



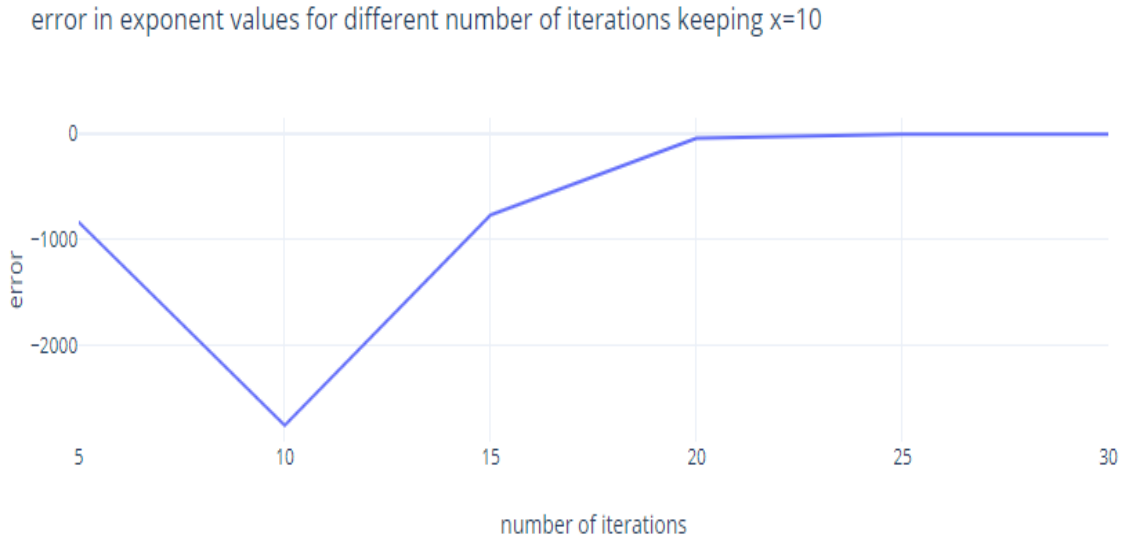
There are some errors between the values calculated by program and the actual values of e^x for different values of x (if number of iterations are kept constant).

This error is pltted wrt different values of x (for n = 30)-



There were also some error when the number of iterations were changed keeping the value of x = constant.

The plot for this is shown below where x = 10



Q2. Implement tan(x) as a infinite series using the Tan series.

The expression for calculating the exponential using infinite series is given as-

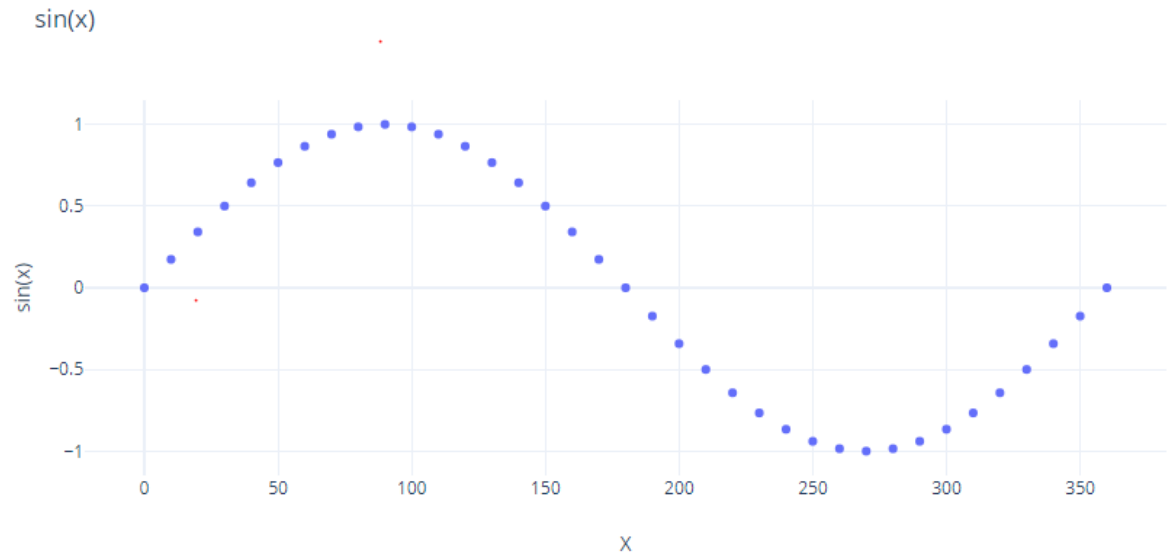
$$\tan x = x + \frac{1}{3}x^3 + \frac{2}{15}x^5 + \frac{17}{315}x^7 + \frac{62}{2835}x^9 + \ldots$$

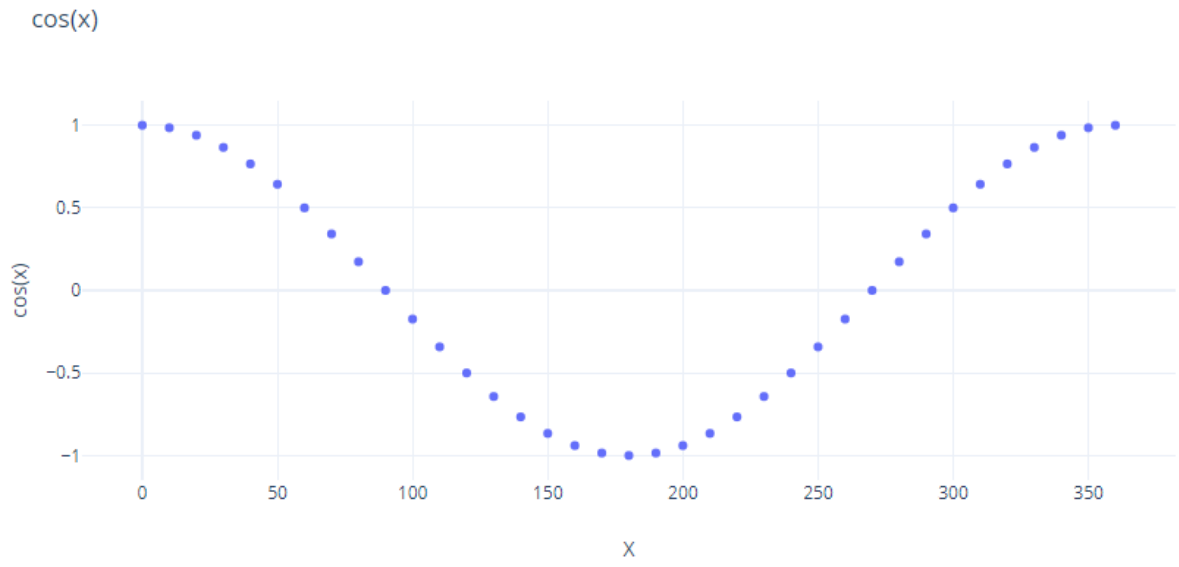
This is hard to implement, so it is implemented by dividing the sin and cos values of x.

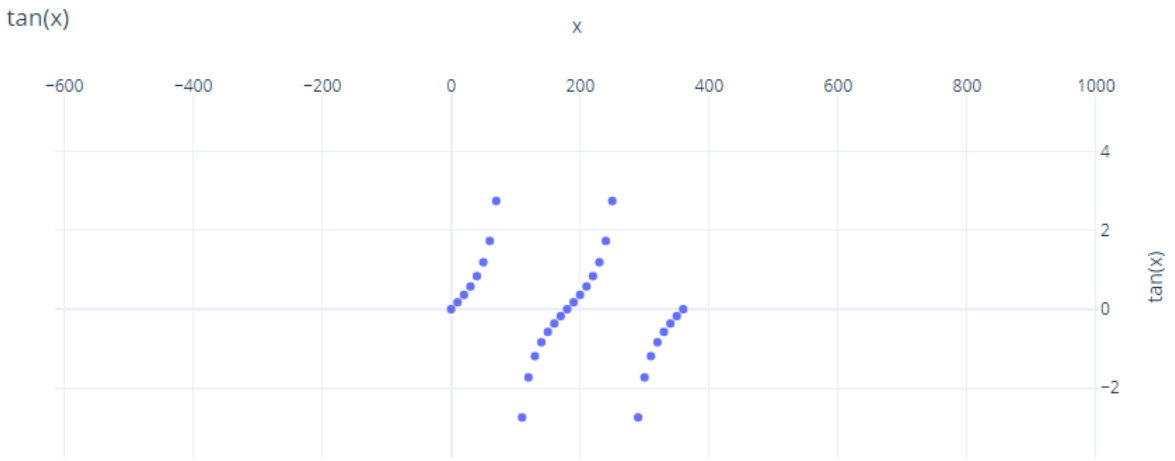
Sin(x) and cos(x) are calculated by different loops.

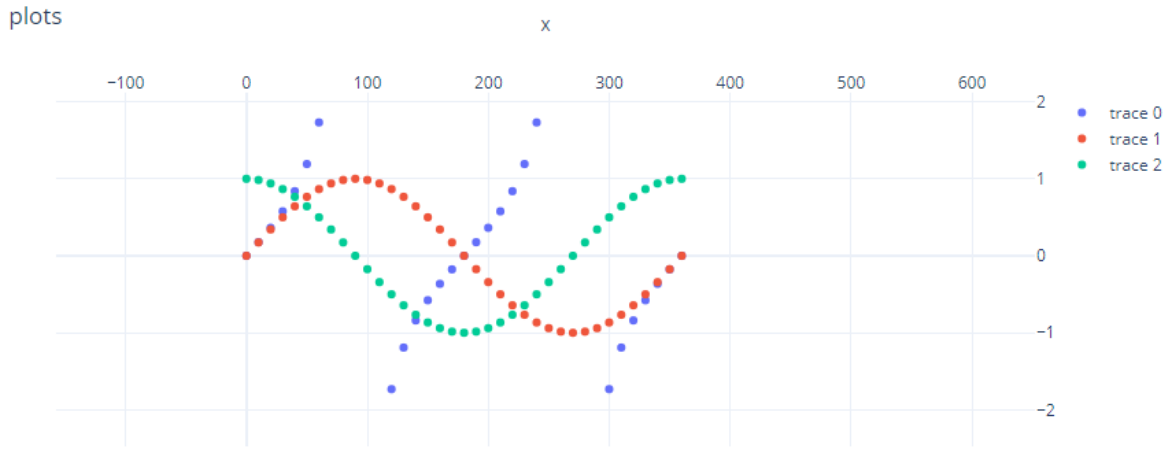
Different loops are used to calculate the powers of x, factorials, division and addition of terms.

The values of sin(x), cos(x), tan(x) are extracted and plotted-






tan(x)
x
−600
−400
−200
0
200
400
600
800
1000
4
2
0
−2
tan(x)


plots
x
−100
0
100
200
300
400
500
600
2
1
0
−1
−2
trace 0
trace 1
trace 2