Assignment- 2

1. Precision were computed using in-built functions in limits library.

   Precision for double is 2.22045e-16 and precision for float is 1.19209e-7.

   For calculation comparison, the method of Liu and Zu was used. For double the precision was calculated as 4.44089e-16 and for float it was 8.7442e-8.

2. Iteration were carried out for both the formulas to calculate the stretch factors.

Beta	Epsilon	Stretch Value (Beta)	Stretch Value (Epsilon)
0.9999999999	0.0000000001	70710.7	70710.7
0.99999999999	0.00000000001	223607	223607
0.999999999999	0.000000000001	707115	707107

   It can be seen the maximum value for which beta is accurate is 0.99999999999.

3.
4.
5.
6. Value of pi is successfully computed using the area approach for the method of polygons. Area of one triangle is given as: 0.5*base*height. Here base=1, always. Height is the imaginary part of the vector at an angle from the origin (same as x1 as discussed in the class.
   Area of polygon= Area of triangle* Number of Sides=π

7.
8. For different values of x, the identity was verified.
9. The quadratic equation was solved with different cases as shown:

a	**b**	**c**	**1st Solution**	**2nd Solution**
1	4	0	0	-4
1	4	2	-0.58578	-3.41421
1	4	6	-2+1.414*i*	-2-1.414*i*
1	4i	-6	1.41421-2i	-1.41421-2i
1	4i	-4	-2i	-2i
1	4i	0	0	-4i
1	2+2i	-6	1.48239-0.597163i	-3.48239-1.40284i

1	2+2i	0	0	-2-2i
1	2+2i	6	-0.5976+1.4823i	-1.40284-3.48239i

10. The eigen values were calculated using the characteristic equation given by: $x^3 - trace(M) * x^2 + (sum\ of\ minors\ along\ diagnol) * x - \det(M) = 0$. Where x are the eigen values and M is the matrix. Let a,b,c be the eigen values or roots of the characteristic equation.

    The first root 'a' is determined using Newton's method. After the root is determined, the characteristic equation, which is now quadratic, is determined using synthetic division. The quadratic characteristic equation now becomes $x^2 + \left(a - trace(M)\right)x + \left(a - trace(M)\right)a + sum\ of\ minors\ along\ diagnol = 0$.

    The Newton Method is used again to determine the second eigen value 'b'. The linear equation containing the remaining eigen value is $x + (a - trace(M) + b = 0$. The last eigen value 'c' is determined the Newton's method for the linear equation.

    The eigen value for the problem in question are given as: 1, -5e-7+i, -5e-7-i