**2019 Numerical Analysis Computer Project #2**

1. Generate *n+1* sample points ***pi*** in a heart-shape geometry, shown in the bottom figure.
   1. Let *t* be the parameter, and *x-* and *y-*coordinates of the sample points be functions of *t*. **

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| T[i] | t0 | t1 | t2 | … | tn-1 | tn |
| X[i] | X0 | X1 | X2 | … | Xn-1 | Xn |
| Y[i] | Y0 | Y1 | Y2 | … | Yn-1 | Yn |

Draw the geometry in a piece of paper and create the sample points by yourselves.

1. Assign the parametric values *ti* of the sample points by using the following 2 methods:
   1. Chord-length:  Define 
   2. Uniform: 
2. Try *n*=5, 11, and 17. (20%)
   1. Print out the sample points of the 2 data sets. Use the afore-mentioned parameterization methods to define *ti*.
3. Generate two Newton’s polynomial from the data sets. (40%)
   1. Print out the coefficients of the polynomial. Use the polynomial to generate 100 points and connect these points to form a geometry. Draw the results.
4. Answer the following questions and explain your answers. (40%)
   1. Which parameterization method is better? Why?
   2. As *n* increases, will the shape of the geometry improve? Why?
   3. Are the locations of the sample points important?
5. Let *n*=11 and use uniform parameterization to generate a data set, as shown in the figure below. Generate 4 cubic Lagrange polynomial by using subsets of the data set: (20%)Uniformly generate 100 points:  using S0(t);  using S1(t);  using S2(t);  using S3(t). Generate the other part of the geometry using the same method and draw the results.

