Math 3890, Machine Problem 10: Due Tu., 11/05/19

1) Write a function `scat03b(x,y,z,v1,v2,v3,e1,e2,e3,ie1)` which given data values z at the vertices (x, y) of a triangulation computes the coefficients of a spline in $\mathcal{S}_3^0(\triangle)$ that (nearly) interpolates the data. It should proceed as follows:
   a) find the barycenters of all the triangles
   b) use `knnsearch` to find the 20 closest points in $[x, y]$ to each of the centers. This is a vectorized function and you can do all centers in a single call.
   c) For each triangle, set up observation equations corresponding to polynomial interpolation at the 20 nearest data points. Weight the first 3 equations by multiplying both sides by $\lambda = 1e6$ (This will force almost interpolation). Then solve for the 10 coefficients by least squares, and store them in the coefficient vector `c`.

2) Write a script to test your function. It should set up an anonymous test function `f`, and prompt for a file name to read a triangulation. Set $z = f(x, y)$. Then call `scat03b` to get the coefficients. Use `valspDP` with $m = 1$ to create sample points for plotting and to compute max and RMS errors. Print these errors and show the plot.

3) Run your code with the data file `tridisk.1089` with the Franke function. For comparison purposes, also run your script using my function `scat03`, and report these errors as well. Finally, also perform C^0 linear spline interpolation on the same data, and list the errors.

4) Repeat 3) with the data file `type2.1089`.

5) Turn in your function and script, the plots of the two cubic splines produced by `scat03b`, and the various lists of errors.