HOMEWORK #1

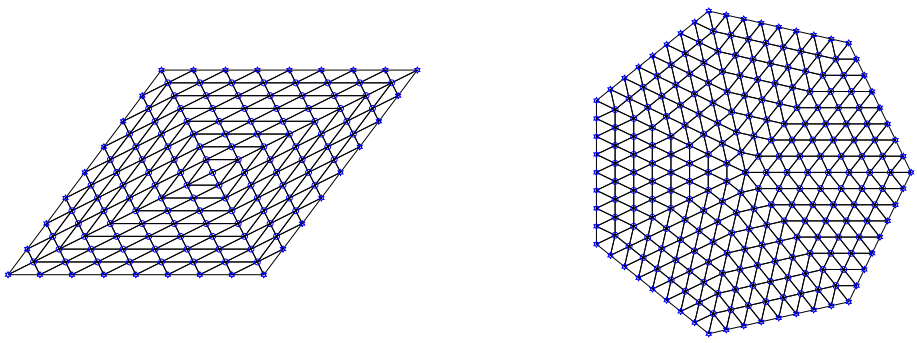
Due: October 17 (Wednesday) by midnight

Instructions:

- The assignment consists of *three* questions, worth respectively 4, 2 and 4 points.
- Submit your assignment *electronically* (via Email) to the instructor; hardcopy submissions will not be accepted.
- It is obligatory to use the MATLAB template file available at `http://www.math.mcmaster.ca/~bprotas/CES717/template.m` (see also the link in the "Computer Programs" section on the left); submissions non compliant with this template will not be accepted.
- Make sure to enter your name and student I.D. number in the appropriate section of the template.
- Late submissions and submissions which do not comply with these guidelines will not be accepted.

Using the suite of computer programs accompanying the textbook as the starting point, write your own MATLAB code that will perform the following tasks:

1. triangulate the rhomboidal and heptagonal domains shown in Figures 1a,b; your meshes should have the same location of free and constrained nodes represented by, respectively, the symbols $\circ$ and $\star$ as indicated in the Figures; the meshes should be then plotted using the command `ShowMesh1`,



(a) (b)

Figure 1: (a) Note that $-2 \geq x \geq 2$ and $-1 \geq y \geq 1$; (b) note that the area of the polygon is equal to one.

(4 points)

2. assess the quality of the meshes generated in the previous point using the quantity $q_1(T) = \sqrt{3}\frac{d_T}{\mathrm{diam}(T)}$ as your criterion; print out the maximum values of $q_1(T)$ obtained for the two meshes; which mesh is better?
(2 points)

3. consider the rhomboidal domain shown in Figure 1a and generate a set of 25 points distributed randomly inside this domain with a uniform distribution; then construct and plot a Delaunay triangulation of that domain using the randomly distributed points as vertices; note that the mesh should additionally include the four nodes determining the boundary of the domain.
   HINT — the function `inpolygon` may be useful during generation of the random distribution of points.
   (4 points)