1. Consider the following subdivision method: starting with a closed polygonal mesh, recursively subdivide by alternating between the Doo-Sabin and Catmull-Clark schemes. What can you say about the following properties:

   - Will it converge to a shape? Why?
   - What can you say about the number of extra-ordinary vertices?

2. Derive the subdivision matrix for de Casteljau subdivision. Pull out the invariant submatrix from the diagonal. What is the size of the invariant neighborhood? We know what the eigen structure should be for C^1 continuous subdivision scheme. If a scheme is C^2 continuous, (such as Bezier curves- the result of de Casteljau subdivision), what properties do you think its eigenstructure should have? I recommend that you check out the SIGGRAPH Course notes on Subdivision (Chapters on Foundation I and II, by Zorin and Schroeder) to get some more information.

3. Derive the refinement matrix for a degree four (quartic) uniform B-Spline scheme. This involves computing a matric representation for a binary subdivision of the B-Spline Curve and computing a refinement matrix from it.