Laboratory 8

1. Prove that the bisectors of a triangle in general position intersect in a single point. Hint: For this exercise, it may be helpful to design a Maple procedure `bisector` that takes the coordinates of two points and returns the equation for the bisector. After you have computed the coordinates of the center of the circumscribed circle, identify the degeneracy conditions.

2. Repeat the previous exercise, but now with parametric representations of lines. A line in parametric representation is a pair $(at + b, \alpha t + \beta)$ where a, b, α, β are real constants and any real number t determines a point on that line.

3. The Maple file

   `circumscribed.mpl`

   contains the definition of a Maple procedure `circumscribed(a,b)` which draws the (red) circle circumscribed to a (green) triangle (0,0), (1,0), and (a,b). Using the results of Exercise 1, modify the function so that it accepts the six arguments a,b,c,d,e,f.

4. Prove that the three medians of a triangle in general position (running from the center of an edge to the vertex on the opposite side) intersect in a single point (the center of gravity). Again, first design a helpful auxiliary Maple procedure. You may do this exercise either with implicit or parametric definitions of straight lines.

5. **Challenge problem:** Design a Maple procedure similar to the one for drawing the circumscribed circle, but now with the circumscribed sphere of a tetrahedron. (The base face of the tetrahedron can be the triangle (0,0,0), (1,0,0), (a,b,0). Usage of parametric representation of straight-lines in 3D-space is recommended.)