1. What parametric surfaces have we studied? Which of these can be defined with control points, and how?
2. What is the formula for a bilinear surface? What information is required to define it? What is the domain of its parameters?
3. What geometric shape do we obtain if one parameter of a bilinear surface is fixed?
4. Describe the face-split step. How many new faces and vertices are created on a 4-regular mesh and on a 6-regular mesh? Draw a figure.
5. What do the even and odd vertices mean in the face-split algorithms?
6. Describe the vertex-split step. Where are the new faces created? Draw a figure.
7. How many new vertices are created on an arbitrary face in the vertex-split algorithms? Does this number depend on the number of sides of the face?
8. Given the cube geometry $[-1,1]^3$, assembled from square faces (its vertices are $[\pm1,\pm1,\pm1]^T$). Perform one refinement step on the cube using the Doo–Sabin (vertex-split) algorithm. How many vertices will the new shape have after the step? What will be the positions of the vertices? How many faces will the new shape have, and what types of faces will they be? Draw a figure.
9. Given the cube geometry $[-1,1]^3$, assembled from square faces (its vertices are $[\pm1,\pm1,\pm1]^T$). Perform one refinement step on the cube using the Catmull–Clark (face-split) algorithm. What will be the positions of the new vertices? Draw a figure.
10. Given a square (e.g. $[-1,1]^2$). Perform one refinement step on the square using the Catmull–Clark (face-split) algorithm. Treat the edges of the square as the mesh boundary (*boundary/crease*). What will be the positions of the new vertices? Is the resulting octagon regular?