

«Computer-Aided Geometric Design»

Assignment 8

November 19, 2025

1. Represent a unit sphere using a biquadratic rational Bézier surface and draw it.
2. Represent the ellipsoid $3x^2 + 2y^2 + z^2 = 1$ using a bicubic rational Bézier surface and draw it.
3. A quadratic Bézier triangle has vertex parameter coordinates $a = (0, 0)$, $b = (1, 0)$, $c = (0.5, 1)$ and the following control points:

$$F(a, a) = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, F(a, b) = \begin{pmatrix} 2 \\ 2 \\ 4 \end{pmatrix}, F(a, c) = \begin{pmatrix} 4 \\ -2 \\ 6 \end{pmatrix},$$
$$F(b, b) = \begin{pmatrix} 4 \\ 4 \\ 0 \end{pmatrix}, F(b, c) = \begin{pmatrix} 8 \\ 0 \\ 4 \end{pmatrix}, F(c, c) = \begin{pmatrix} 6 \\ -4 \\ 4 \end{pmatrix}.$$

Among the three parameters $p_1 = (0.25, 0.5)$, $p_2 = (0.3, 0.75)$, $p_3 = (0.5, 0.5)$, which parameter is outside the triangle? For the parameters inside the triangle, calculate the coordinates of the surface $F(p, p)$ at these parameters using the de Casteljau algorithm.

Assignment Requirements:

Deadline: Tuesday, November 25, 2025