CS 779, Winter 2020
Assignment 3

1. (10 pts) Given a two-space quadratic polynomial in Bézier form over the interval $[0, 1]$ (this specifies the control points; the domain of the curve is the entire real line) and its biaffine blossom f, is there a blossom value of f for every point in the range? If so, give a formula/algorithm for determining a range point's blossom arguments. If not, state which regions of the plane have blossom values and which do not, and give a formula/algorithm for the pre-image of every point in the valid region in terms of the coordinates of the Bézier control points of F and the (x, y) coordinates of the point in the plane. I.e., given a point (x, y) in the plane, find u, v such that $f(u, v) = (x, y)$.

2. (5 pts) For C^1 continuity between two Bézier curves, there is a condition that three points (in this case control points) be colinear and in a particular affine relationship. For C^2 continuity between two Bézier curves, there is the condition that when one particular segment of each control polygon is extended, then you obtain the same point.

   Give similar conditions for C^3 and C^4 continuity. I.e., extend segments of the control polygons to find points that must either be colinear or coincident.

3. (15 pts) Forward differencing.

   - (5 pts) Derive a forward differencing algorithm for cubic polynomials and give pseudo-code that implements it.
   - (10 pts) Implement code for a forward differencing algorithm for cubic Bézier curves. Draw your curve using both foward differencing and de Casteljau's algorithm (or which ever algorithm you used in Assignment 1) to verify the correctness of the algorithm.

     Use floats (and NOT doubles) and see what value of S is required for the forward differencing curve to diverge from the de Casteljau computed curve.