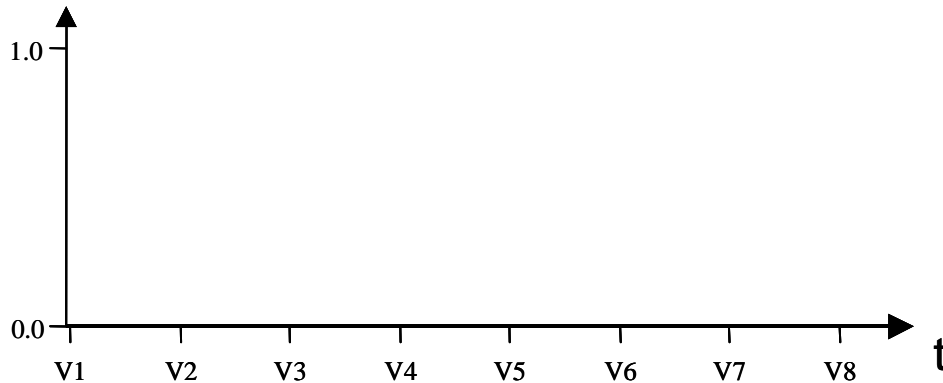


CS526 THOUGHT EXERCISE #3

1. BSPLINE CURVES

- a) Consider a piecewise-cubic uniform Bspline curve defined by 8 control points. Draw the cubic Bspline blending functions used to weight each control point.



- b) What property of these blending functions ensures that the Bspline curve lies within the convex hull of the control points (write one sentence)?
- c) What property of these blending functions indicates that the Bspline curve does not generally interpolate its control points (write one sentence)?
- d) What property of these blending functions indicates that the Bspline curve provides local control (write one sentence)?
- e) Does every isoparametric curve (e.g., along a constant u value) on the surface of a bicubic Bspline tensor product surface patch define a cubic Bspline curve? If so, write a formula for the curve's control points Q_i in terms of the surface's control points V_{ij} . If not, explain why not. Support your answer with a labeled picture.
- f) Why do computer graphics applications use piecewise polynomial curves of degree 3 rather than curves of higher-order, say degree 100?

2. CONTINUITY

- a) What is C1 continuity?
- b) How is it different than G1 continuity?
- c) How is it different than C2 continuity?
- d) How many degrees of freedom are available for a spline with m cubic segments? How many constraints (degrees of freedom) are required to specify C2 continuity at each interior joint of a spline with m cubic segments? How many constraints at the endpoints of the spline? How many degrees of freedom are left?
- e) With the exception of the CAD industry, most people now use triangle meshes and subdivision surfaces to represent complex curved objects? Why? (i.e., what makes modeling with piecewise polynomial splines difficult?)