

Computer Aided Geometric Design
Homework #1
Due Friday, 12 January 2001

1. Send an email to tom@cs.byu.edu with subject "CS557 HW1". Include in the email your name, preferred email address, a secret codename that we can use for posting your grades, a sentence on why you are taking this course (what you hope to learn), and what hours would be best for you to have TA support.

2. A certain cubic Bézier curve $\mathbf{P}(t)$ has control points $\mathbf{P}_0 = (0, 0)$, $\mathbf{P}_1 = (4, 6)$, $\mathbf{P}_2 = (7, 7)$, and $\mathbf{P}_3 = (9, 3)$. Find the (x, y) coordinates of the point $\mathbf{P}(.5)$ using the equation for a Bézier curve (notes page 15):

$$\mathbf{P}(t) = \sum_{i=0}^n B_i^n(t) \mathbf{P}_i$$

where $B_i^n(t) = \binom{n}{i} (1-t)^{n-i} t^i$ and $\binom{n}{i} = \frac{n!}{i!(n-i)!}$.

3. Find the point on the curve in problem 2 corresponding to $t = .5$ using the de Casteljau algorithm (notes page 16).

4. Express the curve in problem 2 as a degree 4 Bézier curve (i.e., degree elevate the curve) (notes page 18).

5. Express the curve in problem 2 as a degree 2 Bézier curve.

6. Express the derivative of the curve in problem 2 as a degree 2 Bézier curve (i.e. find the hodograph).

7. Subdivide the curve in problem 2 at $t = \frac{1}{3}$ (notes p. 20). Sketch the resulting two control polygons and write down the control point coordinates.