Math 155A — Computer Graphics — Winter 2019
Homework #6 — Due Thursday, March 14, 9:00pm
Hand in via Gradescope — Use separate pages for each problem.

1. Suppose a degree three Bézier curve $\mathbf{q}(u)$ in $\mathbb{R}^2$ has control points $\mathbf{p}_0 = \langle -1, 0 \rangle$, $\mathbf{p}_1 = \langle 0, -2 \rangle$, $\mathbf{p}_2 = \langle 3, 0 \rangle$, and $\mathbf{p}_2 = \langle 1, 3 \rangle$. Draw a graph showing these three points, the control polygon, and a sketch of $\mathbf{q}(u)$ for $0 \leq u \leq 1$. Your sketch should show the starting and ending positions and tangencies clearly. What are $\mathbf{q}'(0)$ and $\mathbf{q}'(1)$ equal to?

2. Suppose a particle needs to be animated so that at time $t = 0$ it is at $\langle 0, 0 \rangle$ with velocity $\langle 0, 3 \rangle$, and at time $t = 1$ it is at $\langle 0, 3 \rangle$ with velocity $\langle -2, 0 \rangle$. Express the position of the particle, as a function of time t, in terms of a degree three Bézier curve. What are the control points for the Bézier curve?

3. Repeat problem 2 with the same position and velocity at time $t = 0$ and the same position at time $t = 1$, but with the ending velocity at time $t = 1$ equal to $\mathbf{0} = \langle 0, 0 \rangle$.