Math 155B - Homework #1 - Answers to Selected Problems - Sam Buss
Winter 2005

1: Given $\vec{p}_0 = \langle 0,0\rangle$, $\vec{p}_1 = \langle 3,3\rangle$, $\vec{p}_2 = \langle 3,0\rangle$.

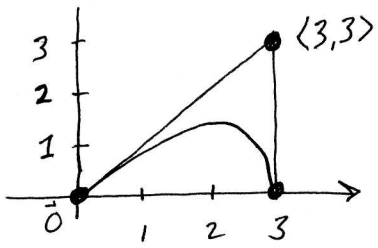
(a) $\vec{r}_0 = \frac{1}{2}(\vec{p}_0 + \vec{p}_1) = \langle \frac{3}{2}, \frac{3}{2}\rangle$;

$\vec{r}_1 = \frac{1}{2}(\vec{p}_0 + \vec{p}_1) = \langle 3, 3/2\rangle$

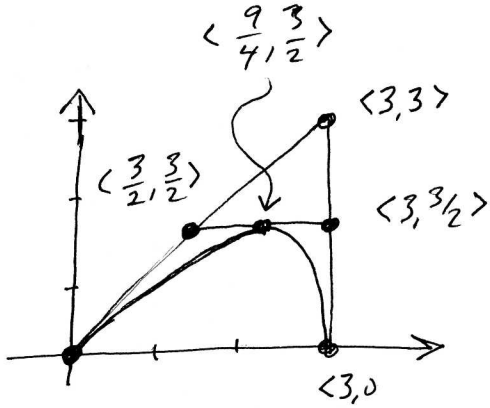
$\vec{q}(1/2) = \vec{s}_0 = \frac{1}{2}(\vec{r}_0 + \vec{r}_1) = \langle \frac{9}{4}, \frac{3}{2}\rangle$

(d) For $u = 1/3$; $q(1/3) = \langle 5/3, 4/3\rangle$

(b)



(c):



(c): Control points for 1st curve: $\langle 0,0\rangle$, $\langle 3/2, 3/2\rangle$, $\langle 9/4, 3/2\rangle$

Control points for 2nd curve: $\langle 9/4, 3/2\rangle$, $\langle 3, 3/2\rangle$, $\langle 3,0\rangle$

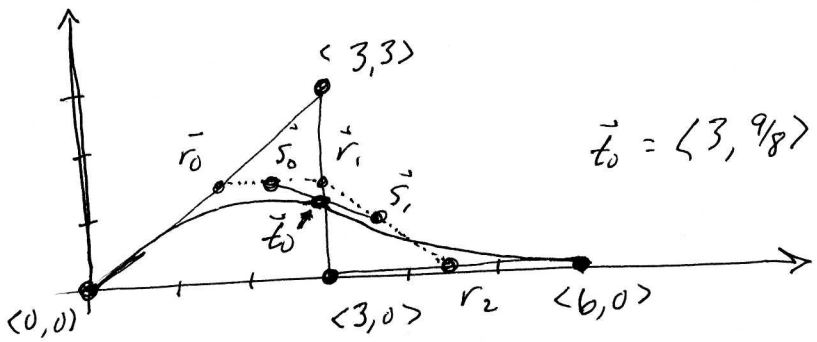
2: Given $\vec{p}_0 = \langle 0,0\rangle$, $\vec{p}_1 = \langle 3,3\rangle$, $\vec{p}_2 = \langle 3,0\rangle$, $\vec{p}_3 = \langle 6,0\rangle$.

(a) $\vec{r}_0 = \frac{1}{2}(\vec{p}_0 + \vec{p}_1) = \langle \frac{3}{2}, \frac{3}{2}\rangle$ $\vec{r}_1 = \frac{1}{2}(\vec{p}_1 + \vec{p}_2) = \langle 3, 3/2\rangle$, $\vec{r}_2 = \frac{1}{2}(\vec{p}_2 + \vec{p}_3) = \langle 4\frac{1}{2}, 0\rangle$

$\vec{s}_0 = \frac{1}{2}(\vec{r}_0 + \vec{r}_1) = \langle \frac{9}{4}, 3/2\rangle$ $\vec{s}_1 = \frac{1}{2}(\vec{r}_1 + \vec{r}_2) = \langle \frac{15}{4}, \frac{3}{4}\rangle$

$\vec{q}(1/2) = \vec{t}_0 = \frac{1}{2}(\vec{s}_0 + \vec{s}_1) = \left(3, \frac{9}{8}\right)$

(b)



$\vec{t}_0 = \langle 3, 9/8\rangle = \vec{q}(1/2)$

(d) For $u = 1/3$: $\vec{r}_0 = \frac{2}{3}\vec{p}_0 + \frac{1}{3}\vec{p}_1 = \langle 1,1\rangle$ $\vec{r}_1 = \frac{2}{3}\vec{p}_1 + \frac{1}{3}\vec{p}_2 = \langle 3,2\rangle$, $\vec{r}_2 = \frac{2}{3}s_2 + \frac{1}{3}s_3 = \langle 4,0\rangle$

$\vec{s}_0 = \frac{2}{3}\vec{r}_0 + \frac{1}{3}\vec{r}_1 = \langle \frac{5}{3}, \frac{4}{3}\rangle$ $\vec{s}_1 = \frac{2}{3}\vec{r}_1 + \frac{1}{3}\vec{r}_2 = \langle \frac{10}{3}, \frac{4}{3}\rangle$

$\vec{t}_0 = \frac{2}{3}\vec{s}_0 + \frac{1}{3}\vec{s}_1 = \langle \frac{20}{9}, \frac{4}{3}\rangle$.