CSE 167 - Intro to Computer Graphics - Fall 2004

Homework #4
This homework is not to be handed in.
Answers are included on the second page
Revised Wednesday, December 8.

For problems 1-3, let the ranges of variables be $R, G, B, H, L \in [0, 1]$ and $H \in [0, 360)$. For problems 4-5, the Bézier curves are degree three.

1. Let a color be specified with $R = 1.0$, $G = 0.5$ and $B = 0.5$. Express the color in HSL form.

2. Same as 1., but with $R = 0.0$, $G = 0.75$, $B = 0.5$.

3. Same as 1., but with $R = 0.25$, $G = 0.5$, $B = 0.25$.

4. A Bézier curve $\mathbf{q}$ has control points $\mathbf{q}_0 = \langle 0, 0 \rangle$, $\mathbf{q}_1 = \langle 0, 1 \rangle$, $\mathbf{q}_2 = \langle 1, 1 \rangle$ and $\mathbf{q}_3 = \langle 2, 0 \rangle$.

a. Graph the control points and the control polygon.

b. Give a freehand sketch of the curve. Be sure to show the beginning and ending slopes clearly.

c. What point is $\mathbf{q}(0)$? $\mathbf{q}(\frac{1}{2})$? $\mathbf{q}(\frac{1}{3})$?

d. What are the values of the derivatives $\mathbf{q}'(0)$ and $\mathbf{q}'(1)$?

5. Suppose a Bézier curve $\mathbf{q}$ has $\mathbf{q}(0) = \langle 0, 1 \rangle$, $\mathbf{q}(1) = \langle 3, 0 \rangle$, $\mathbf{q}'(0) = \langle 3, 3 \rangle$, and $\mathbf{q}'(1) = \langle -3, 0 \rangle$.

a. What are the four control points of the curve?

b. Draw a graph showing the control points, the control polygon and the Bézier curve.

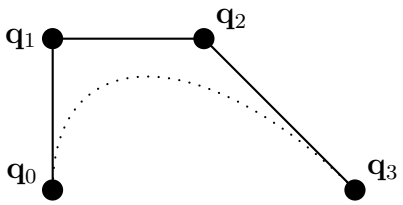
Homework #4 Answers

1. $H = 0,\ L = \frac{3}{4},\ S = 1.$

2. $H = 144,\ L = \frac{3}{8},\ S = 1.$

3. $H = 120,\ L = \frac{3}{8},\ S = \frac{1}{3}.$

4.



c. $\mathbf{q}(0) = \langle 0, 0\rangle.\ \mathbf{q}(\frac{1}{2}) = \langle \frac{5}{8}, \frac{3}{4}\rangle.\ \mathbf{q}(\frac{1}{3}) = \langle \frac{8}{27}, \frac{2}{3}\rangle.$

d. $\mathbf{q}'(0) = \langle 0, 3\rangle.\ \mathbf{q}'(1) = \langle 3, -3\rangle.$

5. .

a. $\mathbf{q}_0 = \langle 0, 1\rangle.\ \mathbf{q}_1 = \langle 1, 2\rangle.\ \mathbf{q}_2 = \langle 4, 0\rangle.\ \mathbf{q}_3 = \langle 3, 0\rangle.$

b.