CS559 Written Assignment 3

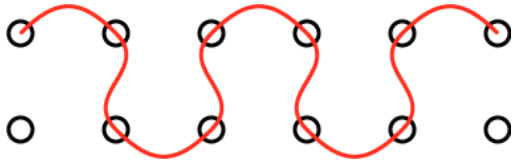
1A. (0.1719,0.7188)

1B. First Part: (0,0),(0,0.25),(0.0625,0.5),(0.1719,0.7188)
Second Part: (0.1719,0.7188),(0.5,1.375),(1.25,1.75),(2,1)

1C. 3*(P3-P2) = 3*[.1719 – 0.0625] = [0.3281,0.6562]
.7188 – 0.5

1D. (2,1), (3,0) (derivative of last 2 points of first curve should match the derivative of the first 2 points of the new curve)

1E. (2,1), (3,0) (the first derivative(n=1) depends on n+1 = 2 points; refer page 366 in SM book)

2A. 

2B. It should be clear from the sketch that the X range is 0 to 5. To find the Y range, use the answer in Part C to find the height, and note that things are symmetric: -1/6 to 1 1/6

2C. Let the points of the CR curve P0,P1,P2,P3, and the points of the Bezier B0,B1,B2,B3
The segment will go from P1 to P2, with the derivative at P1=1/2(P2-P0). Since the derivative at the beginning of a cubic bezier is 3 times the vector, the vector B0 B1 must be 1/6 of this derivative vector. Symmetry gives us the other end.

B0 = P1 = (0,1)
B1 = B0 + 1/3 (1/2 (P2-P0)) = P1 + 1/6 (P2-P0) = (1/6, 1 1/6)
B2 = B3 + 1/3 (1/2 (P3-P1)) = P2 - 1/6 (P3-P1) = (5/6, 1 1/6)
B3 = P2 = (1,1)

3A. Use f(u) = a0 + u*a1 + u^2*a2 to set up the equations with u=0.25

$$C = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1/2 & 1/4 \\ 1 & 1 & 1 \end{bmatrix}$$

3B. $B = C^{-1}$

3C. f0(u) = 1 - 3u + 2u^2
f1(u) = 4u - 4u^2
f2(u) = -u + 2u^2

4A. (20,10)

4B. (10,10)

4C. Gourad Shading uses per-vertex shading. Therefore it finds the intensities of the vertices (2 ends at 0,0 and 10,0) and interpolates the values for all intermediate points. As the lighting is symmetric intensities at both these points will be the same. For all points between, the value of intensity is the same. (refer pg 178 in SM book)

4D. (0,0) will be the brightest spot. Find the view direction, light direction and then evaluate the half vector. Then use the phong shading model to calculate the L values for both the 'vertices' and compare. (refer page 82-83 in SM book)