CS 779
Fall 2002
Assignment 5
Due: Monday, December 2

1. (5 points) Page 363, exercise 1.

2. (5 points) Use your b-spline editor (below) to do and provide examples for exercise 3, page 363.

3. (10 points) Page 428, exercise 2.

4. (10 points) If a knot in the knot sequence for a B-spline has multiplicity 2, then the continuity of the curve is one lower at the corresponding joint. However, suppose that we have the knot sequence $(0, 1, 2, 3, 4, 5, 6)$ for a cubic B-spline f, and further suppose that $f(2, 3, 4) = f(3, 4, 5)$.

   The theorem on continuity tells us that this curve should be C^2 at $F(3)$. Verify that this curve is C^2 at this point.

5. (20 points) Extend your curve editor from assignment 3 to draw cubic B-splines curves using the de Boor algorithm, with the following features:

   - Left mouse to place new point.
   - Right mouse to click-and-drag existing point.
   - Menu option to clear curve from screen
   - Menu option to select between drawing
     - Just the curve
     - The curve plus the control points (which should be labeled P0, P1, etc.).
     - The curve plus the control points (labeled or unlabeled, your choice), plus the lower degree curves used to construct the curve. For example, for a degree curve, your display should look similar to somewhat similar to Figure 7.3. There is **no** need draw your curves in different colours.

     You should be able to draw B-splines curves with at least 20 segments

   You will need to specify the nodes $t_0 \ldots t_n$. Initially set t_0 to 0, and then set t_{i+1} to $t_i + 1$. Provide a reasonable mechanism allow the user to change the values of the nodes.

6. (Extra credit: 5 points) Add another display option to draw the Bézier control points and control nets for the B-spline curve.