QUIZ 2 - MACS 441
Fall 2011

Rules:
(1) You have to show your work to get credit for any problem
(2) One page (letter sized, possibly double sided) of handwritten notes is allowed, but no other books or notes
(3) Sign your exam!
(4) There are six questions

1. The values of a scalar function at $(0,0)$, $(1,0)$, $(0,1)$ and $(1,1)$ are:
0 at $(0,0)$
10 at $(1,0)$
20 at $(0,1)$
0 at $(1,1)$.
What is the bilinearly interpolated value at $(0.2, 0.4)$?

2. Consider two Bezier curves:

B1: with control points $(0,0)$, $(1,1)$, $(2,2)$, $(4,0)$

B2: with control points $(4,0)$, $(8,-4)$, $(3,3)$, $(0,0)$.

Questions:

(2a) Does B1 meet B2 smoothly at $(4,0)$?

(2b) Does B2 meet B1 smoothly at $(0,0)$?

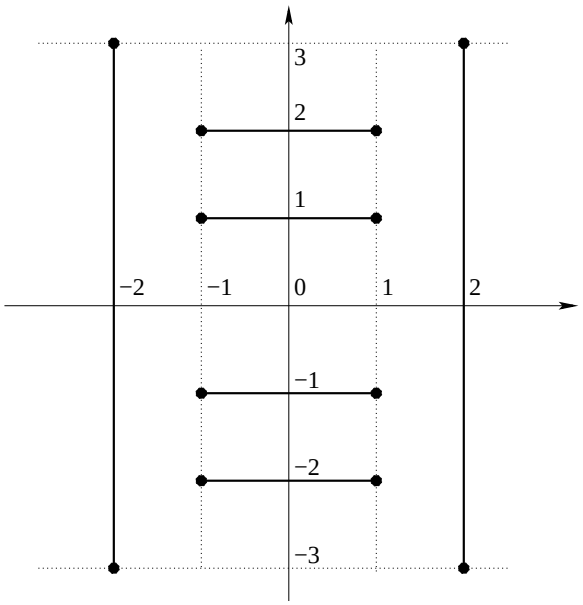
Don't forget to explain why.

3. Give a pseudocode that would print out all half-edges out of a given vertex w in a planar subdivision represented using a half-edge datastructure.

Use the following notation:
v.h = a half-edge out of vertex v
h.o, h.p, h.n = the opposite, previous and next half-edge for h
h.v = starting vertex of h
print h = print out a half edge h

4. Use B-spline subdivision to obtain a sequence of 5 control points that are control points for a cubic B-spline curve that looks identical to the cubic B-spline with control points (8,8), (8,0), (16,0), (24,0).

5. Consider the set of six line segments consisting of:
Interval connecting (-2,3) with (-2,-3)
Interval connecting (2,3) with (2,-3)
Interval connecting (-1,-2) with (1,-2)
Interval connecting (-1,-1) with (1,-1)
Interval connecting (-1,1) with (1,1)
Interval connecting (-1,2) with (1,2)
See the enclosed figure showing the line segments as thick lines.



Draw a BSP tree for this set of line segments (use the variant which stores line segments at all nodes). Note that there is a number of correct answers here; any one will give you full credit.

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6. Write out the adjacency table (as discussed in class) for the mesh with the following triangle table

$$\begin{bmatrix} 0 & 1 & 2 \\ 1 & 0 & 3 \\ 3 & 2 & 1 \\ 3 & 0 & 2 \end{bmatrix}.$$

Use all the standard conventions we used in class (in particular, number rows/columns/triangles etc. starting with zero).
