

## Problem Set 9

**Due:** In class on Wednesday, April 28. Starred problems are optional.

**Problem 9-1.** Show that any VLSI layout can be transformed into a nearly square layout. That is, even a long skinny layout can be folded to be close to square.

**Problem 9-2.** Show that for any VLSI layout of a complete binary tree with all the leaves in a straight line, that the total wire area is  $\Omega(n \log n)$ .

**Problem 9-3.** Show that any binary tree with an even number of nodes can be cut exactly in half by cutting  $O(\log n)$  edges. What is the constant?

**Problem 9-4.** Show that there is a layout for cube-connected-cycles network (or a butterfly) with  $n = k2^k$  vertices with only  $O(n^2 / \log^2 n)$  area.

**Problem 9-5.** \* Show that the minimum dimension of any layout of a complete binary tree is  $\Omega(\log n)$ .