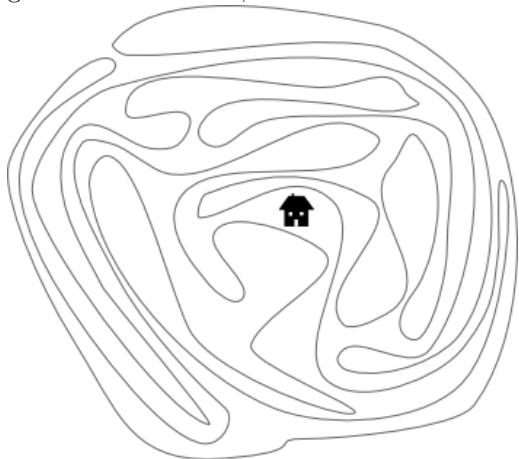# MATH CLUB: WINDING NUMBER

APRIL 22, 2018

1. The figure below shows a house and a very complicated fence around it. (You can check taht it is a single continuous fence, not several different ones.) Is the house inside or outside the fence?

2. The figure below shows a tree (dot in the middle of the figure) and a loop of wire around it (again, one can check that it is a single continuous loop, not several disconnected ones.)
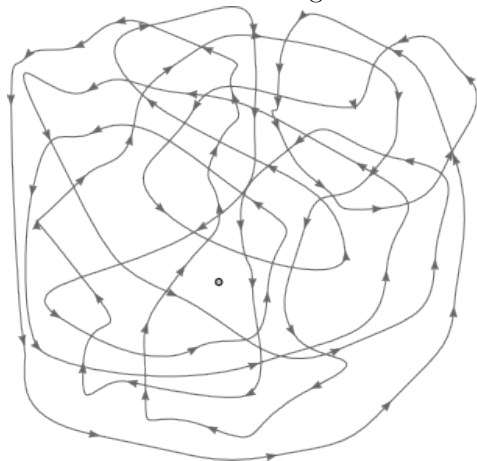
   (a) Is it possible to remove the wire without cutting it?
   (b) How many times does the wire go around the tree?

3. Is it possible to make a loop of wire around two posts in the ground so that the wire can not be removed without cutting, but if any one of the posts is removed, then the wire can be removed from the other post?

*4. Same question about 3 posts.

5. An electric circuit has 16 nodes, arranged in a 4×4 square. Some of the nodes are connected by wire segments. Each wire segment can only connect two nodes which are horizontally or vertically adjacent.

   How many measurements do you need to verify that all nodes are connected to each other? [Each measurement allows you to check whether two nodes are connected.]

   Same question for 6×6 nodes.