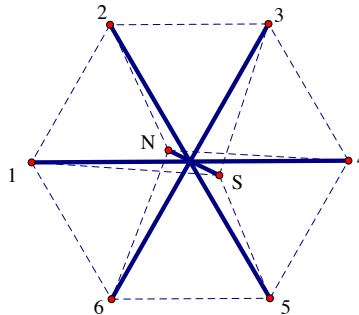


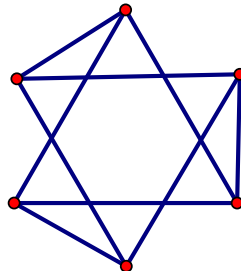
## Math 4550 Homework #9

Problems due in class Friday, November 16: Read Section 5.9 in my book. Extra credit if you build some interesting examples.

- The figure shows a regular hexagon, where struts and cables are indicated. The  $N$  and  $S$  vertices are on top of each other with a strut between them. All 12 cables have stress 1, and the 4 struts have stress  $-1$ . Calculate the stress matrix and its rank. In particular, find a universal configuration for the indicated stress. That is, find the maximum dimension of the affine span of a configuration with the given stress. Is the given tensegrity, in the plane, universally rigid?



- The following bar framework has 3-fold rotational symmetry about the center of the congruent equilateral triangles. Is that bar framework rigid in the plane? Is every realization of this framework with the same bar lengths rigid in the plane?



- Suppose that two generically realized isostatic rigid bar frameworks  $G_1$  and  $G_2$  are joined together generically in the plane at two vertices  $a$  and  $b$ , where there is no bar connecting  $a$  and  $b$  in either graph.
  - Show that  $G_1 \cup G_2$  is not isostatic, since it has too many vertices bars.
  - Show that there is a bar that can be removed such that  $G_1 \cup G_2$  is isostatic.