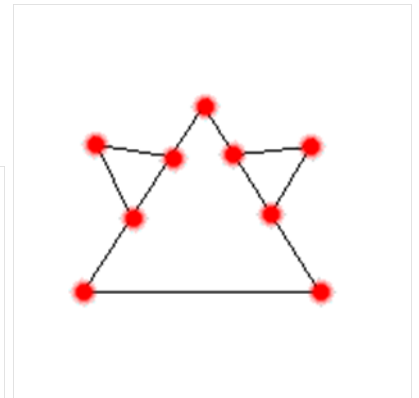
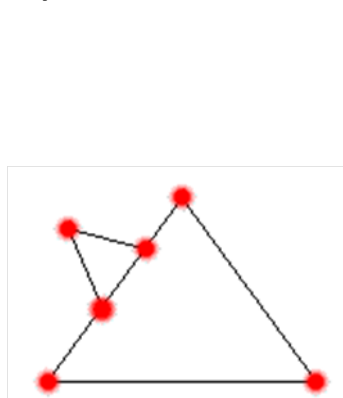
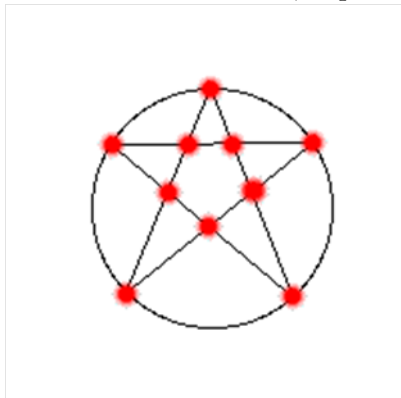


## Homework 14: Presentations (Ryan, Tianruo and Eric R.)

*Due Friday, week 7**UCSB 2014*

Do **two** of the **four** problems below!

1. (Eric R.) A soccer ball is made out of pentagons and hexagons that are stitched together. Given that a sphere has a Euler characteristic of 2, derive the number of hexagons and pentagons on the ball.
2. (Eric R.) *Expansion of the Utilities Problem:*
  - (a) There are three neighbors, and all of them want to connect to gas, water, and electricity. Is there a way for them all to do so such that no connection crosses another? Prove this is not possible.
  - (b) Find a shape on which it is possible, and explain why it works in terms of the Euler characteristic.
3. (Tianruo) A gambler is in Vegas, and is currently betting on the following (very simple) event: flip a coin. If it comes up heads, you win twice what you bet; if it comes up tails, you lose what you bet. You can only bet 1 dollar on each flip. Suppose that your gambler starts with 10 dollars, and will leave the table either when they're either broke or have doubled their money (20 dollars.) Also, because this is Vegas, suppose that the coin is imperceptibly biased towards the house. It comes up heads 48 percent of the time, and tails 52 percent of the time. How often does the gambler walk away broke? Use the matrix way to solve it out.
4. (Ryan)
  - (a) For each of the graphs below, determine whether it has an Euler path. If it does, find one. If it does not, explain why it does not.



- (b) If you do not untie the knot or cut through the rope, how can these two guy separate from each other?

