CCS Discrete III | Professor: Padraic Bartlett

Homework 17: Toroidal Graphs

Due Friday, week 10 | *UCSB 2015*

Pick **one** of the problems in this set to solve! Solutions need justification and proof to receive full credit: i.e. it is not enough to simply draw the answer.

Also, in class I mentioned that I would have a problem describing the torus here. I decided that this was something better done in class, so look for this there!

1. Let G be a planar n-vertex graph with girth k (i.e. a graph that contains a k-cycle as a subgraph, but no smaller cycles as subgraphs.)
   (a) Prove that G has at most $(n-2)\frac{k}{k-2}$ edges.
   (b) Explain why this means the Petersen graph is nonplanar.
2. (a) Show that if G is a planar graph on 11 vertices, then the complement of G is nonplanar.
   (b) Find a planar graph G on 8 vertices such that its complement is planar.