# Math 390 Homework 6

Due Friday, March 11

Solutions should be written LaTeX or Markdown and converted to a PDF. You are encouraged to work with others on the assignment, but you should write up your own solutions independently. This means no copy pasting. You should reference all of your sources, including your collaborators.

1. (a) Can $K_{3,4}$ be drawn on the projective plane with no edge crossings? Can $K_{4,4}$ be drawn on the projective plane with no edge crossings? Prove your answers. (Recall that if a nonplanar graph can be drawn on the projective plane with no edge crossings, then the drawing must satisfy $n - m + f = 1$.)

    (b) Can $K_{3,4}$ be drawn on the torus with no edge crossings? Can $K_{4,4}$ be drawn on the torus with no edge crossings. Prove your answers. (Recall that if a nonplanar graph can be drawn on the torus with no edge crossings, then the drawing must satisfy v e + f = 0.)

2. Consider the following graph:
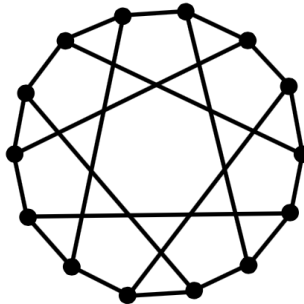
    (a) Draw this graph on a torus without edge crossings. (Hint: Draw the cycle of length 14 so that it goes around the torus.)

    (b) Create the dual graph to your answer to part (a). What graph is it?