Muffin and Grid Coloring Midterm Problems,
Morally due Mon March 1, 9:00AM

On March 9 you will be taking your first midterm. It will be 2-hours and be 75 points.

Why 75 points?

Because THIS document has TWO problems that you will do ahead of time and have plenty of time to do, which is worth 25 points.

This must be handed in typed and easy to read.

Here are the problems:

1. (15 points) Prove that $\boldsymbol{f(59,22) \leq \frac{167}{374}}$.

   It should be in the same format as the slides (Cases and such) but DO NOT leave out any cases. **You may assume each muffin is cut into two pieces.**

   ADVICE FOR YOUR WRITE UP: There is LaTex code on the homework website for the muffin article and muffin talk. You can use that to help you if you need to.

   On the third line of the tex file I have a macro (command) called ob that will, take a number a and produce $\frac{a}{374}$.

   I use it when here:

   Prove that $f(59,22) \leq \frac{167}{374}$.

   You want to use that so you don't have to keep typing in 374.

2. (10 points) Prove that for all 3-colorings of the 4×19 grid there is a monochromatic rectangle (four points that form the corners of a rectangle that are the same color.