Math 1205B
Winter 2019

UPDATED GENERAL INFORMATION — FEBRUARY 25, 2018

Grades for the first examination

The cutoff scores are as follows:

A — 86
B — 50

The median score was 90.5.

Appeals regarding the grading of this examination must be submitted by the end of the final examination on **Monday, March 19**. Written comments should be placed on the examination indicating the problems or issues to be reconsidered. BRIEF and OBJECTIVE statements about specific issues may be included.

Statement on final grade determination:

As noted previously, the course grade will be determined by a weighted average of the grades on the examinations, the quizzes and the homework. The cutoff points for A, B, C, D, F will be determined individually for each each of these constituents, and for grading purposes the raw numerical scores will be normalized as follows:

4.0 = perfect score, 3.0 = lowest A, 2.0 = lowest B, 1.0 = lowest C, 0.0 = lowest D, -1.0 = zero score. If the raw numerical score lies between two of these values, the normalized score will be determined by linear interpolation.

EXAMPLE. If the lowest A is 88, the lowest B is 72, and a student's raw numerical score is 76, then the raw score is 4 points above the lowest B, the difference between the lowest A and the lowest is 16, and therefore the grade is $\frac{4}{16} = \frac{1}{4}$ of the way from the lowest B to the lowest A; linear interpolation means that the normalized score on the examination is **2.25**.

Posting of scores

These will be available on **iLearn** shortly after this file is posted.

Comments on answers to problems

1. It was interesting to see the variety of maximal trees that were given. There were a few misunderstandings about the definition of Euler path. Such a path goes over each edge exactly once. It may well go through a vertex multiple times. One example is a graph consisting of two triangles with a single vertex in common.

2. There were numerous problems with omitted or mishandled steps. There are four parts to the proof.

By compactness E has finitely many sheets.

The preceding implies that the index of the image of $\pi_1(E)$ in $\pi_1(S^1) \cong \mathbb{Z}$ is finite.

The preceding implies that the image is equal to $n \cdot \mathbb{Z}$ for some positive integer n.

Isomorphism classes of based coverings correspond to subgroups of $\pi_1(S^1) \cong \mathbb{Z}$, and for each positive integer n the n^{th} power map $S^1 \to S^1$ is an example corresponding to the subgroup $n \cdot \mathbb{Z}$.

3. Points were deducted for not being explicit enough about the separation of the argument into cases depending upon whether two edges were both in X or X', or one was in X while the other was in X'. The mathematical literature is filled with mistakes which arose when the various cases were not enumerated or considered carefully.

4. Two sources of difficulties were not formulating van Kampen's Theorem precisely or carefully enough (for example, there were several cases where some of the arrows were reversed) and not adequately noting how the simple connectivity of U and X are needed in the argument.

Another source of difficulty involved incorrect assertions that the image of $\pi_1(U \cap V)$ in $\pi_1(V)$ was all of the latter; we can only say that the normal subgroup *normally generated* by the image is all of $\pi_1(V)$. Some standard examples are given by knotted curves in 3-dimensional space, which we shall view as compact subsets of S^3. If one has a smoothly knotted curve as in `trefoil.pdf`, then one obtains a splitting of S^3 into arcwise connected open subsets $U \cup V$ such that the curve is a strong deformation retract of U (hence the fundamental group is infinite cyclic) and $U \cap V$ is homeomorphic to $S^1 \times S^1 \times \mathbb{R}$. In such examples van Kampen's Theorem implies that $\pi_1(V)$ must be normally generated by an infinite cyclic subgroup; however, for a knotted curve $\pi_1(V)$ is nonabelian and hence this infinite cyclic subgroup does not exhaust the entire funcamental group. All we can say is that $\pi_1(V)$ is the smallest normal subgroup containing this infinite cyclic subgroup.