Math 598K Spring 2009
Moduli Spaces & Stacks
Syllabus

Faculty: Ralph Kaufmann
Office: MATH 710, Tel: (765) 494–1205
E-mail: rkaufman@math.purdue.edu
URL: http://www.math.purdue.edu/~rkaufman

Class times: TTh 9-10:15 am in REC303

Homepage for the course:
http://www.math.purdue.edu/~rkaufman/MA598Ksp09/598.html

Office hours: Th 10:30-11:15 and by appointment.

Texts: Varying texts, mostly available on the internet, will be announced.

Course description: We will discuss stacks in the topological, algebraic geometric and differentiable categories. Applications will include moduli spaces, orbifolds, gerbes and a dash of Gromov--Witten theory.

When considering questions like what is the quotient of a space by a group action, which is not necessarily nice, or what kind of space classifies all objects of a certain type --these spaces are usually called moduli spaces-- one realizes that the quotient or universal space are not of the same type as those one started with. For instance, taking the quotient of a manifold by a Lie group action might not lead to a manifold. Also the moduli space of all Riemann surfaces does not behave as expected if one considers it merely as a space. The solution to these problems are orbifolds or stacks.

There has been an avid interest in stacks from many different aspects in the last years and the literature is growing exponentially as classical results are being transferred and extended to this new setting. Stacks play a central role in algebraic geometry in Gromov-Witten theory, but they also appear in number theory, topology and as orbifolds in differential geometry. In particular, the derived algebraic geometry approach in topology heavily uses stacks. The interest has also been stoked by physics, where stacks naturally appear as quotients of systems by symmetries.

In the course, we will start with the motivating examples of group actions and moduli spaces. We will then define stacks in topology, differential and algebraic geometry and look at basic properties of them. As further examples, we will study orbifolds in more detail and look at a dash of Gromov--Witten theory.

Required Work: Besides the expected participation in class there will be some homework assignments and possibly a take home final or written project at the end of the semester. The homework will be listed on the webpage. Homework will be collected but not graded.

Academic Adjustments for Students with Disabilities:
Students who have been certified by the Office of the Dean of Students – Adaptive Programs as eligible for academic adjustments should go to MATH 242 with a copy of their certification letter and request an *Information Sheet* for this semester that explains how to proceed this semester to get these adjustments made in Mathematics courses. It is not the same as last semester. **This should be done during the first week of classes**. Only sstudents who have been certified by the ODOS-Adaptive Programs and who have requested ODOS to send their certification letter to their instructor are eligible for academic adjustments.

Students, who are currently undergoing an evaluation process to determine whether they are eligible for academic adjustments, are encouraged to find out **now** what procedures they will have to follow when they are certified, by requesting the above mentioned *Information Sheet* from MATH 242.