

## Final Projects, Math 711

To be presented some time in the final week or during the exam period; you can work in pairs.

The assignment is to present one of the following results (or another one that we decide on through consultation) in class, about a half hour, together with a write-up.

1. Develop the theory of modules over a ring  $R$  and prove the positive primitive quantifier elimination. Useful material can be found in the book on the model theory of modules by Mike Prest or in articles by Martin Ziegler.
2. Develop infinitary first order logic and prove the Scott isomorphism theorem and compute the Hanf number. Both of these results are classical. The book by Barwise, Admissible sets and structures contains everything needed and much more.
3. From the same book of Barwise, present a proof of Linstrom's characterization of first order logic as outlined in class.
4. Give a proof that countable unstable theories have many models in uncountable cardinals. There is a sketch of a proof in Marker and another one in the book by Hodges.
5. Present the results in the section of Marker's book on independence results in arithmetic and in particular the Paris-Harrington theorem.
6. Use the model theory of the real field to give a resolution of Hilbert's 17<sup>th</sup> problem. This is also in Marker's book.
7. Marker also includes a proof of Morley's result about the number of countable models of a countable theory - it is still the best result regarding Vaught's conjecture.