

## Proposal for MATH490 Independent Project: p-Adic Egyptian Fraction Algorithms

There are numerous algorithms for decomposing fractions into an Egyptian fraction representation, i.e. as a sum of unit fractions. This research project will inspect some of these methods in an attempt to generalize them to algorithms that decompose fractions into a p-adic Egyptian fraction.

The background material for this project will mainly come out of Number Theory and Foundations of Mathematics. In particular, the role of prime factorizations, discrete algorithms, and the basics of p-adic numbers will be used from Number Theory. Proof techniques and the notion of nonstandard metrics from Foundations will also likely be utilized.

For this project, the algorithms on the website below will be studied in depth. In addition a more thorough understanding of the p-adics will be required. The initial sources for this material will be from:

- <https://www.ics.uci.edu/~eppstein/numth/egypt/intro.html>
- *p-adic Numbers: An Introduction* by Fernando Gouvêa
- E. Errthum, "A division algorithm approach to p-adic Sylvester expansions," *Journal of Number Theory*, **160**, March 2016, Pages 1–10

This research project will be supervised by Dr. Errthum.