1106-VQ-675 **Jasmine Powell*** (jasminepowell2015@u.northwestern.edu), **Andrew Best**, **Patrick Dynes**, **Steven Miller** and **Benjamin Weiss**. *The Emergence of 4-cycles Over Extended Integers.*

Given a ring R and a polynomial f in $R[x]$, an n-cycle is a sequence of n elements of the ring, $(x_1, \ldots, x_n)$, such that $f(x_1) = x_2, f(x_2) = x_3, \ldots, f(x_n) = x_1$. If we consider polynomials in $\mathbb{Z}[x]$, we can quickly see that long cycles are hard to find. In fact, it turns out that over the integers, the only possible cycle lengths are 1 and 2. However, adjoining elements of the form $1/p$ with p prime to our ring of integers is known to sometimes introduce 4-cycles. To determine whether adjoining certain sets of prime reciprocals will introduce 4-cycles, we analyze an equivalent problem: namely, when do four products of primes sum to 0 (each of the four summands may be taken with a positive or negative sign)? Combinatorial techniques allow us to derive conditions on sets of primes that either do or do not admit 4-cycles. We additionally use a numerical approach to investigate the distribution of the sets of primes that admit 4-cycles and examine patterns that emerge. (Received September 04, 2014)