Problem Set 5

Due: Monday, 2 November.

Problem 1. Prove that no nonconstant multivariate Diophantine polynomial[1] can have a range consisting entirely of various powers of two.

Problem 2. Prove that if an integer in the range of a nonconstant multivariate Diophantine polynomial is divisible by some integer k, then there are infinitely many integers in the range which are divisible by k. Conclude that no nonconstant multivariate Diophantine polynomial can have a range consisting entirely of various primes.

Problem 3. Extend the Scheme Substitution Model in the file `SM.SCM` (available on the course website) to include some the following Scheme forms: `cond` as a "first-class" form – not sugar; `let*`; lambda expressions taking a variable number of arguments, e.g.,

```
(lambda l
  (if (null? l)
      (begin (display ``I need numerical arguments'') 'uh-oh)
      (apply + l)))
```

(Optional: add *internal* `define`'s, possibly as sugar but better as a first-class form.)

[1] Saying a polynomial is "Diophantine" means it has integer coefficients and its variables range over only the integers.