

# Diophantine Equations to the Power of $n$

MATC15 - Project - Draft 1

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**Conjecture:** Let  $x$  be an arbitrary integer.

$$x^n = \sum_{i=1}^n y_i^n \text{ has an integer solution such that } y_i \neq x, \forall i.$$

Andrew D'Amario, February 18, 2021

## 1 Introduction

The objective of this project is to investigate the conjecture above: whether or not we can always find at least one integer solution to equations of the form  $x^n = y_0^n + \dots + y_n^n$  given any  $x$ , excluding trivial solutions involving  $y_i$ 's = 0 or  $x$ .

Some of this investigation and research will involve:

- Computational analysis on random integers raised to the power of  $n$  and finding an integer solution to the sum.
- Noting differences between even and odd  $n$ .
- Identifying different families of solutions that take on a similar form.

Though this conjecture may be false, we hope to investigate as much as we can on the matter and provide some deeper research to the subject.