

# On the Diophantine Equation $(a + 2)^x - a^y = z^2$ where $a = n^2 - 1$ and $a$ and $n$ are non-negative integers

Panadsaya Dokpong<sup>1</sup>, Phedcharat Chimma<sup>1</sup>, Sriwan Khamwansri<sup>1</sup>

Pirunrat Kawchaimaha<sup>2</sup>

<sup>1</sup>*Kaennakhonwittayalai student , Email 654s46851@knw.ac.th*

<sup>2</sup>*Kaennakhonwittayalai school*

## Abstract

In this paper, we find all non-negative integer solutions  $(x, y, z)$  of the Diophantine equation  $(a + 2)^x - a^y = z^2$  which have three solutions where  $a, n$  are non-negative integers with  $a = n^2 - 1$ . In the proof, we apply reasonably Catalan's conjecture and various theories concerning the congruence to obtain the solutions. The result reveals that the solutions are  $(0, 0, 0)$  or  $(1, 0, n)$  or  $(2, 2, 2n)$ .

**Keywords :** Diophantine equation, Catalan's conjecture, Integer solution