Seminar 1: Equations

The Hidden Language of the Universe

Frank Yu

Sichuan University Pittsburg Institute

May 5, 2025

Definition

In mathematics, an equation is a mathematical formula that expresses the equality of two expressions, by connecting them with the equals sign " $=$ ".

Solving an equation containing variables consists of determining which values of the variables make the equality true. The variables for which the equation has to be solved are also called **unknowns**, and the values of the unknowns that satisfy the equality are called **solutions of the equation**.

There are two kinds of equations: identities and conditional equations. An **identity** is true for all values of the variables. A **conditional equation** is only true for particular values of the variables.

Starting From the Simplest One

$$x = 1$$

Order $= 1$

How about *Order* $= 2$?

$n = 3, 4, 5...$

$$x^n = 1$$

Let's Draw A Map

USING "EQUATIONS" AS A CLUE...

The Curve of Fastest Descent (Brachistochrone)

- Find the curve along which a particle, under gravity and without friction, reaches B from A in the shortest time.
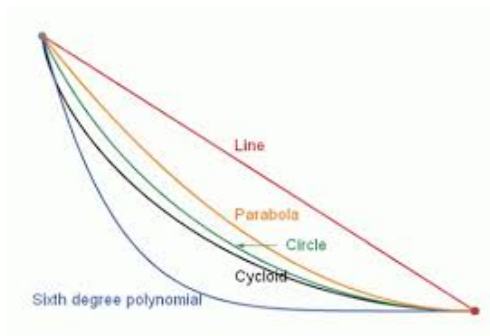- Johann Bernoulli, 1696

Figure: The Brachistochrone is a Cycloid