Real Numbers in Math for Machine Learning

Definition:

Real numbers include all the numbers on the number line. They consist of:

- Natural numbers: 1, 2, 3, ...
- Whole numbers: 0, 1, 2, 3, ...
- Integers: ..., -2, -1, 0, 1, 2, ...
- Rational numbers: numbers that can be written as fractions (e.g., 1/2, -4/5)
- Irrational numbers: numbers that cannot be expressed as fractions (e.g., pi, sqrt2)

Analogy:

Imagine a straight road (number line). Every possible point on this road is a real number:

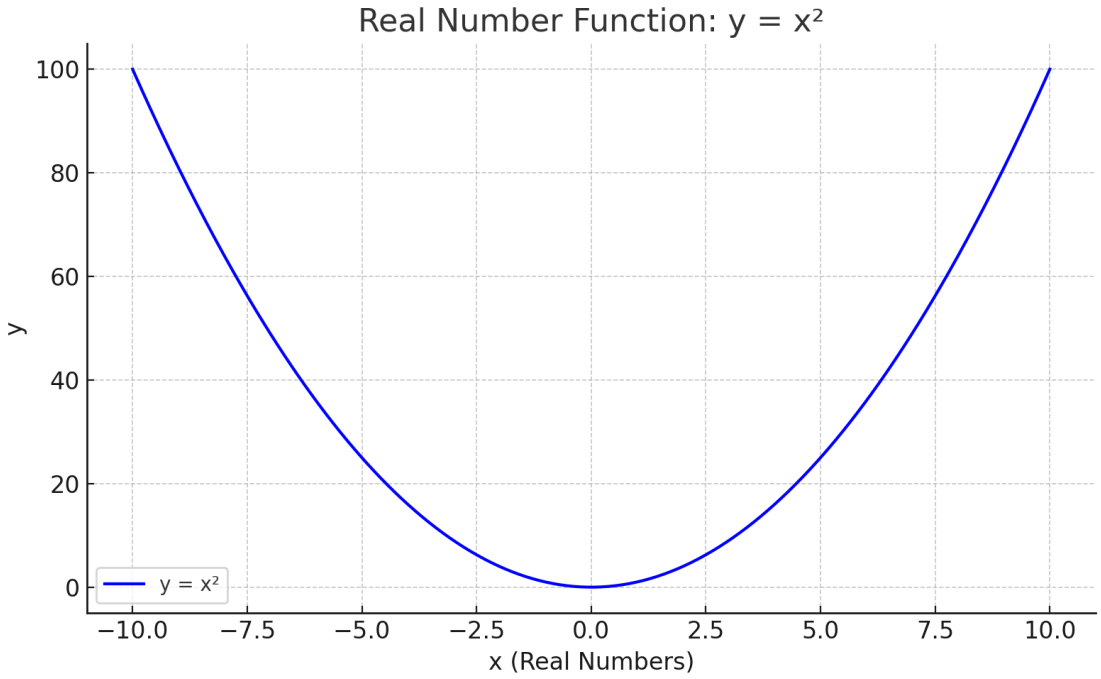
- Steps on the pavement (1, 2, 3) are natural numbers.
- Starting at your home (0) is the whole number.
- Moving backward (-1, -2) are integers.
- Taking half steps (0.5, -0.25) are rational numbers.
- Unmeasurable steps like stepping at the square root of 2 meters or pi meters are irrational numbers.

Application in ML:

In machine learning, real numbers are used to represent:

- Weights in neural networks
- Features like age, height, temperature, etc.
- Continuous outputs in regression problems

Now, let's solve and visualize using NumPy.


Real Number Function: y = x²
100
80
60
40
20
0
y
y = x²
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0
x (Real Numbers)