Big O Notation

A mathematical notation which describes the upper limit of the function depicting the relationship between the time and input size.

For example, for

$$O(N^3)$$

The time complexity cannot exceed O(n^3). It can be O(n^2), O(n), O(log n), but it can't be greater than O(n^3).

Let's dive into the mathematical part

If

$$f(n) = O(g(n))$$

then,

$$\lim_{n \to \infty} \frac{f(n)}{g(n)} < \infty$$

f(n) → $6(n^3) + 3n + 5 = O(n^3)$ ← O(g(n))

$$\lim_{n \to \infty} \frac{6(n^3) + 3n + 5}{n^3}$$

$$= \lim_{n \to \infty} 6 + \frac{3}{n^2} + \frac{5}{n^3}$$

Substituting n = infinity

$$= 6 + \frac{3}{\infty} + \frac{5}{\infty}$$

$$= 6 + 0 + 0$$

$$= 6$$

$$< \infty$$

And that's why we ignore constants as well as less dominating terms!