Some mathematical models of physical phenomena can be very complex and cannot be solved accurately or require more sophisticated mathematical techniques for their solution.
In many of these cases, the only alternative is to develop a numerical solution that approximates the exact solution and physically represents the problem under study.
One of these problems is to discover a function that best represents the speed of a body in free fall and estimates its terminal speed, close to the Earth's surface. This free-falling body will be a parachutist.
An analytical mathematical model for the speed (m/s) of a body in free fall is given by the expression:

$$\boldsymbol{v(t) = \frac{g.m}{c}\left(1 - e^{-\left(\frac{c}{m}\right)t}\right) \qquad (1)}$$

Where m is the mass of the object (Kg), t is the time in seconds (s), c is a proportionality constant called drag coefficient kg/s and represents the properties of objects in free fall, such as the shape or roughness of the surface. surface, which affect air resistance and g is
the gravitational constant, or the acceleration due to gravity, which is approximately equal to 9.8 m/s^2.

Note that after a sufficiently long time, a constant speed is reached,
called terminal velocity given by the equation:

$$Vter = \frac{\mathrm{g.m}}{\mathrm{c}}$$

This speed is constant because eventually the force of gravity will be in balance.

The problem under study considers for the calculations c = 12.5 kg/s and m = 68.1 kg

The following table presents the time considered measured in seconds (s) and the observed speeds measured in meters per second (m/s).
Table 1 - Observed speeds of a parachutist in free fall

Tempo (s)	Velocidades observadas (m/s)
1	10.00
2	16.30
3	23.00
4	27.50
5	31.00
6	35.60
7	39.00
8	41.50
9	42.90
10	45.00
11	46.00
12	45.50
13	46.00
14	49.00
15	50.00

After observing the behavior of the data, two polynomial models were used to approximate the observed speeds. The 1st model is a polynomial of degree 2

$$\boldsymbol{v(t) = a_0 + a_1 t + a_2 t^2}$$

and the other is a polynomial of degree 4

$$\boldsymbol{v(t) = b_0 + b_1 t + b_2 t^2 + b_3 t^3 + b_4 t^4}$$

Note that polynomials of degree ≥ 2 are also considered linear models, but in their parameters.

The objective of this work is to implement a numerical method to find the polynomial model that best approximates the observed velocities and the terminal velocity and compare it with the existing analytical mathematical model (Eq. 1), proving that a polynomial model can have a good performance to estimate the observed speeds, as well as the terminal velocity.

So, write a program that allows you to:

1 - Determine the values of the speeds obtained through the model given by Eq. (1).

2 - Determine after how many seconds the approximate terminal velocity is reached to two decimal places →

$$Vter = \frac{\mathrm{g.m}}{\mathrm{c}}$$

3 - Determine, to 7 properly rounded decimal places, the parameter values for each proposed polynomial model in order to better approximate the observed velocities and predict the terminal velocity.

4 - Plot the joint graph for the observed speeds, speeds obtained by the model given by Eq. (1) and the speeds obtained by the polynomial models of degree 2 and 4. If you prefer, you can draw 3 graphs for each model containing the observed speeds.

5 - Choose which of the two proposed models best approximates the observed velocities and provides an estimate for the terminal velocity closest to the real value of this constant. Justify your choice by presenting the appropriate calculations.