Exercise 8 page 264 in book

A skydiver of mass m in a vertical free fall experiences an aerodynamic drag force (luftmotstand)

$F_D = C_D \cdot \dot{y}^2$ where y is measured downward from the start of the fall. The differential equation describing the fall is:

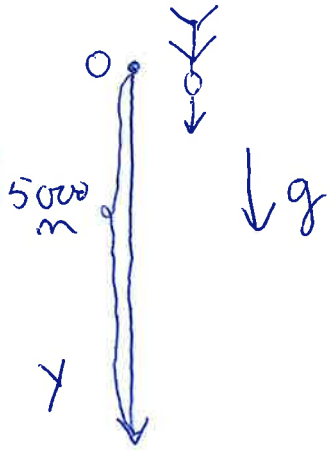
$$\ddot{y} = g - \frac{C_D}{m} \cdot \dot{y}^2$$

$g = 9.80665\ m/s^2$

$C_D = 0.2028\ kg/m$

$m = 80\ kg$

$\left(\dot{y} = \frac{dx}{dt},\ \ddot{y} = \frac{d^2x}{dt^2}\right)$



Determine the time of a 5000 m fall

Modify the code FlexibleRungeKutta4 such that you by studying the graph showing the position of the skydiver, determine how long time it takes!

Rewrite to a system of first order equations

$y_0 = y,\ y_1 = \dot{y}$

$y_0' = y_1$

$y_1' = \ddot{y} = g - \frac{C_D}{m} \cdot \dot{y}^2 = g - \frac{C_D}{m} \cdot y_1^2$

$$\begin{bmatrix} y_0' \\ y_1' \end{bmatrix} = \begin{bmatrix} y_1 \\ g - \frac{C_D}{m} \cdot y_1^2 \end{bmatrix}$$

Top position defined as zero

$y_0(0) = y(0) = 0$

$y_1(0) = 0$

No speed initially

Tip:
1) Modify function F(x,y)
2) Modify initial condition
3) Play with xStop and appropriate h (h_1, h_2)
4) Modify what to plot

Answer, approx 85 seconds seen from the graph.