In 2012, Felix Baumgartner successfully jumped from a height of 39.0 km above the surface of the Earth. Use Euler's method to determine the time of his fall. Use 0.1 second time intervals and take into account the following:

1. The force of air drag is given by: $F_D = \frac{1}{2}\rho A C v^2$
2. $g$, the acceleration due to gravity, changes with height according to : $g = \frac{9.8 \text{ m/s}^2}{(1+\frac{h}{R_E})^2}$.
3. The changing air density associated with a jump from this altitude.

$$\rho = 1.2 \text{ (kg/m}^3)e^{-\frac{h}{1 \times 10^4}} \tag{0.1}$$

In the equations above, $C = 0.58$, $A = 1.04$ m$^2$, h is the altitude above the surface of the earth, and $R_E = 6.37 \times 10^6$ m. Use a mass of 73 kg for Felix and assume that his initial velocity was zero.

1. How long does it take Felix to reach earth? Give your answer to the nearest second. (Note: We are not considering a parachute in this calculation.)
2. Compare the real fall time that you just found to the dragless, constant-$g$ (9.8 m/s$^2$) fall time.
3. Give the height, speed, and acceleration for Felix at $t = 100$ s