Faites particulièrement attention au mots en rouge (gras)

Exercise 6a

The fall of a skydiver can be **modeled** by the following differential equation :

$$m\frac{dv}{dt} = mg - \alpha v^2, \qquad (1.1)$$

where v is the skydiver's velocity, m his mass, g **the acceleration due to gravity**, and α a real positive constant **characterizing the frictional force** of the fluid media.

1. **Calculate the derivative of** arctanh = $\tanh^{-1}$.

2. Use this result to express the skydiver's velocity as a **function of time**. Show that this velocity **tends asymptotically towards** a value which you will give in terms of the constants of the problem.

Exercise 11b

Given a **right triangle** with hypotenuse H and **legs** l and L, one then measures the lengths of two of the sides. Let us take H=15cm with **absolute uncertainties** of $\Delta H = \Delta L = 0.1\text{cm}$.

1. Express the length l of one **side** as a function of the two other sides (i.e. H and L). Write the expression of dl (respectively Δl) in function of dH and dL (respectively ΔH and ΔL). Calculate Δl for $L = 7cm$. Calculate the **relative uncertainty**, $\frac{\Delta L}{L}$, for $L = 1\text{cm}$, $L = 7\text{cm}$, and $L = 14.5\text{cm}$. What commentary do these results inspire ?
2. Let us denote by θ**,** the angle between sides l and H. Give the expression for $d\theta$ (resp. $\Delta\theta$) in terms of dL and dH (resp. ΔL and ΔH). Calculate $\Delta\theta$ in the case where L=10cm.
3. Give the expression for $d\theta$ (resp. $\Delta\theta$) in function of dl and dH (resp. Δl and ΔH). Calculate again $\Delta\theta$ in the case where $L = 10\text{cm}$. Why do we not find the same result as in the **previous** question ?