Bisection

> There will be no worked-out solutions posted. **Post your solutions and questions on the dedicated Discord channel**. Working solutions should emerge from the discussion with the aid of the lecturer and the TAs.

Consider the ballistic problem from lecture 2. The question is the following: "Given the air friction coefficient and initial velocity, under what angle should we launch a cannonball to land a certain distance away?". In the tutorial folder on GitHub (`https://github.com/MATH-CS-2072U/Tutorial_01`) you will find the Python function that gives horizontal distance traveled as a function of the elevation angle.

Task 1 Using the function in the tutorial repo, write a script that uses bisection to solve the cannonball problem Assume the following values of the parameters: $g = 9.81\,(m/s^2)$, $c = 0.01\,(kg/m)$, $v_0 = 100\,(m/s)$. The target distance is $R = 85\,(m)$. Find the angle of elevation with an error less than $0.01\,(radians)$.

Task 2 This is a bit more challenging, complete this task only if you have time left and want to dig a bit deeper.
Repeat task 1 for a range of values of R and plot the result (the angel of elevation) as a function of R. Keep the following in mind:

- for most values of R there are two solutions – a fast, low shot and a high, looping shot. Try to find and plot both.
- Do a few values by hand and then try to make the whole procedure automatic. You will need to include the call to the bisection function in a loop over values for R.