Lab Assignment 6

Wednesday, April 21, 2021

Question:

While patrolling the waters of Bay of Bengal, Indian Navy's INS Kora detects an enemy ship approximately 54.00 km. from it's position due west. It launches an explosive projectile at the enemy ship at an angle, θ= 30^o with an initial speed, u= 2815.58 km/hr. The ship's tracker records the trajectory of the projectile, and data obtained is given in the table below.

x (km.)	h (km.)
0	0.0000
18	6.9282
24	7.6980
42	5.3886
48	3.0792
54	0.0000

1. Write a function to perform Lagrange Interpolation for a given value of x. Use this function to estimate the height, h of the projectile at x = 3, 15, 27, 39 and 51 kms.
2. Also calculate the relative error in your estimation. The trajectory is modelled by the following equation:

$$h = \tan\theta \cdot x - \frac{\mathrm{g}}{2 \cdot u^2 \cdot \cos^2\theta} \cdot x^2$$

Take g = 9.81 m/s^2.