CE 640 / OC 512 Matlab

Homework 7 – Differential Equations

1. The equations of motion for a projectile subject to air resistance are:

In these equations, u and v are the velocity components, is the velocity vector whose magnitude is the speed , g is gravity, and  is a drag coefficient. If you define four variables, say y1 🡪 y4, as the horizontal position (x), vertical position (y), horizontal velocity , and vertical velocity , you can restate the problem as a set of four first order ODEs.

Use the initial conditions

with a launch angle of 40 degrees and a launch speed of 180 m / s. Compute and plot the trajectory for friction coefficients of 0, 0.05, 0.1, and 0.2. Either superimpose all four plots, or, if the axis limits for the 4 cases are very different, you may find it more pleasing to make a 2x2 subplot. As usual, label axis with names and units, and use legends as necessary.