

HW7: Introduction to Dynamical Systems

Due: at the beginning of the lecture on Wed 10/31

Problem 1:

A dead body is found at Noon in an office that is maintained at 72°F . If the body is 82°F when it is found, and has cooled to 80°F at 1 pm, estimate the time of death. (Assume a living body maintains a temperature of 98.6°F .)

- 1) Solve this problem analytically. Use LaTeX to type your solution. Then include the Overleaf shared link on the first line of the Matlab code for the next part (use the Matlab comment sign % before the link).
- 2) Use Matlab ode45 to solve this problem numerically. Then compare the result with the analytical one in Part 1.

Problem 2:

Suppose a mass of 0.5 kg is attached to a spring with spring constant $k = 2 \text{ N/m}$.

- 1) Assume that there is no damping and the spring is compressed 1 m and then released. Build the second-order differential equation to represent the mass-spring system. Use Matlab ode45 to find the motion of the mass.
- 2) Suppose that the mass and spring of Part 1 is now attached to a dashpot which exerts a resistive force proportional to velocity with $c = 0.2 \text{ N/(m/s)}$. Build the second-order differential equation to represent the mass-spring system. Use Matlab ode45 to find the motion of the mass.