

Task 1 Mathematical Modeling, Numerical Methods, and Problem Solving

Read Chapter 1 in the course textbook: Applied Numerical Methods with MATLAB® for Engineers and Scientists, Fourth Edition, 2017.

- **Part 1**

Review the free-falling bungee jumper problem (Section 1.1).

1. Implement a function in Python that takes the step size as an input parameter and gives the approximate problem solution from 0 to 12 seconds. Show the solutions for steps sizes of 0.5, 1, and 2.
2. Plot the three approximate solutions along with the analytical solution (given in Example 1.1, page 7) on the same plot.

- **Part 2**

1. Solve Problem 1.9. Based on your manual calculations, plot the depth y versus t in Python.
2. Solve Problem 3.13 (page 22) in Python (not Matlab).
3. Solve Problem 1.18 (page 23). Carry out the plot required in (c) using Python.

This is a team task (with 6-7 students per team). Each team should submit one PDF file on Blackboard. The submission should contain the following: The Python code (include the code in the PDF and also as well-documented working Python scripts)

1. The output from the code
2. All hand calculations
3. All hand calculations

Submission Deadline: 11:59 PM on April 21, 2021