Homework 14

Ch En 263 – Numerical Tools

Due date: 16 May 2020

Instructions

- For the handwritten problems, submitted a single pdf file on Learning Suite with the name "LastName_FirstName_HW14.pdf".
- For the problems in Excel, submit a workbook named "LastName_FirstName_HW14.xlsx" where each worksheet tab is named "Problem_1", "Problem_2", etc.
- For the problems in Python, submit a separate file for each problem named "Last-Name_FirstName_HW14_ProblemXX.py" where XX is the problem number.
- Please report how long it took you to complete the assignment (in hours) in the "Notes" section on Learning Suite.

Problems

1. In this problem, we are going to find the *four* solutions for x and y to the following equations

$$2x^2 + y^2 = 1 (1)$$

$$(0.5x - 0.5)^2 + 2(y - 0.25)^2 = 1.$$
(2)

- (a) Write out by hand the equations in standard, vector form f(x) = 0 where f_0 is Equation 1, f_1 is Equation 2, $x_0 = x$ and $x_1 = y$.
- (b) In Python, make a plot of the two equations with the variable y on the y-axis and the variable x on the x-axis. *Hint: Re-arrange Eq. 1 and Eq. 2 to solve for y. Remember that when solving* $y^2 = f(x)$ *for y, the solution is* $y = \pm \sqrt{f(x)}$.
- (c) Write a Python code to solve for the four roots. Use the plot from part (b) for your initial guesses. Please print the converged values to the console, so the grader can easily locate them.
- 2. Solve for the single root in the following system with three equations and three unknowns

$$x^{2} + y^{2} = 1$$
$$xy + yz = -1.1$$
$$y^{2} + z^{2} = 2$$

in Python. Hint: A reasonable initial guess is x = 2, y = 2, z = 1.