Name: _____

Date: _____

Collaborators: _____

(Collaborators submit their individually written assignments together)

Question:	1	2	3	Total
Points:	20	25	10	55
Score:				

Instructor/grader comments:

1. (20 points) Let u represent the electrostatic potential between two concentric conducting spheres of radii r_1 and r_2, $(r_1 < r_2)$. The potential of the inner sphere is kept constant at $u(r_1) = V_1$, and the outer sphere is grounded, $u(r_2) = 0$. The potential in the region between the two spheres is governed by the following equation:

$$\frac{\mathrm{d}^2 u}{\mathrm{d}r^2} + \frac{2}{r}\frac{\mathrm{d}u}{\mathrm{d}r} = 0.$$

Write a matlab script, **hw07p1.m**, to find the numerical solution of the boundary value problem above using the finite difference method. Use the following numerical values of the parameters:

$$r_1 = 2 \text{ a.u.}, \quad r_2 = 4 \text{ a.u.}, \quad V_1 = 100 \text{ a.u.}.$$

Use one of the matlab's own ode IVP solvers as a part of your method. Explain your choice in your README file.

On the same figure plot your numerical solution as well as the following analytic solution of the BVP:

$$u(r) = \frac{r_1}{r}\left(\frac{r_2 - r}{r_2 - r_1}\right)V_1.$$

2. (20 points) Use the nonlinear shooting algorithm to approximate the solution to the boundary-value problem

$$y'' = -(y')^2 - y + \ln x, \quad 1 \le x \le 2, \quad y(1) = 0. \quad y(2) = \ln 2.$$

(a) (5 points) Write down the system of equations that you need to solve at each iteration step

Place your code to the script named **hw07p2.m**. Use one of the matlab's own IVP solvers as a part of your method. Explain your choice in your README file.

On the same figure plot your numerical solution as well as the analytical solution of the BVP,

$$y(x) = \ln x.$$

Gitlab

3. (10 points) Create a gitlab project called **hw07** (name it exactly as shown). Upload **all** required matlab code and create your README.md file. Share the project with the instructor.