Problem #1:

Let y(x) be the solution to the following initial value problem,

y’ = yx2 3 , y (0) = 4.

(a) Use Euler's method with step size h = 0.4 to find the approximate value of y(2).

(b) Repeat part (a), but this time with step size h = 0.2.

Problem #1(a):

7.0893

Problem #1(b):

8.1435

Problem #1 Attempt #1 Attempt #2 Attempt #3 Attempt #4 Attempt #5

Your Answer: 1(a) 7.0893

1(b) 4.3278

1(a)

1(b) 8.1435

1(a)

1(b)

1(a)

1(b)

1(a)

1(b)

Your Mark: 1(a) 2/2 ✔

1(b) 0/2✗

1(a)

1(b) 2/2 ✔

1(a)

1(b)

1(a)

1(b)

1(a)

1(b)

Problem #2:

Solve the initial value problem in #1 above analytically (by hand).

Problem #2:

4*exp(x^3/9)

Enter your answer as a symbolic function of x, as in these examples

4ex3/9

Do NOT include 'y = ' in your answer.

Problem #2 Attempt #1 Attempt #2 Attempt #3 Attempt #4 Attempt #5

Your Answer:

4ex3/9

Your Mark: 3/3 ✔

Problem #3:

In this problem we will illustrate (graphically) the increasing accuracy of the Euler's method approximations as the step size decreases.

Use Euler's method to solve the initial value problem in #1 above for x-values between 0 and 2, using step sizes h = 0.4, 0.2, and 0.1. Sketch the Euler's method approximations as well as the exact solution all on the same graph. (So there should be 4 curves in total on the same graph.)

Use solid (not dotted) lines for all four curves. Use a different color for all 4 curves, and include a legend to distinguish each of them. For the exact curve be sure to use enough x-values so that the curve is smooth.

Use your First Name, Last Name, and Student Number as the title for the graph (e.g., 'Johnny Good, 1234567').

Save the graph as a Portable Network Graphics (.png) file, and then upload it.

Problem #3:

isombeg_A2_q2_part_d.png

Problem #4:

A truck at the origin is tied by a rope of length 3.4 to a trailer that begins on the y-axis at the point (0, 3.4). If the truck drives along the x-axis (perpendicular to the initial direction of the rope) the trailer will follow a path called a “Tractrix” given by y(x) where y satisfies the differential equation

$$\frac{dy}{dx} = -\frac{y}{\sqrt{3.4^2 - y^2}}$$

Here, since the trailer is always being pulled in the direction of the rope, the slope of the trailer’s path is equated to the slope of the rope pulling it. Use Euler’s method with a step size of $h = .01$ to create a graph of the path of the trailer for x values from 0 to 17. In order to avoid division by zero, begin your graph at the point $(x, y) = (0, 3.39)$.

Use your First Name, Last Name, and Student Number as the title for the graph (e.g., 'Johnny Good, 1234567').

Save the graph as a Portable Network Graphics (.png) file, and then upload it.

Problem #4:

isombeg_A2_q1_part_e.png

Problem #5:

Copy and paste the Matlab code that you used to produce your answers and graphs for this lab into the answer box below, and save it.

DO NOT COPY ANY PART OF ANOTHER STUDENT'S CODE. SUBMITTING OTHER PEOPLE'S WORK AS YOUR OWN IS A VERY SERIOUS ACT OF ACADEMIC DISHONESTY.