MECH 105: Homework 18

Instructions

Please read the problem carefully. For full credit turn in two files.

1. The Simspson_LastName.m file of the function
2. The script file named homwork18_LastName.m to complete part 2.

Part 1

Write a general MATLAB function for integrating experimental data using Simpson's 1/3 rule. Your function should check if there are an odd number of intervals, if there are, the trapezoidal rule should be used for the last interval. The first line of your MATLAB function should look like:

`function I = Simpson_LastName(x,y)`

Where the function numerically evaluates the integral of the vector of function values 'y' with respect to 'x'

Your matlab function should also include the following:

- Error check that the inputs are the same length
- Error check that the x input is equally spaced
- Warn the user (not an error, just a warning) if the trapezoidal rule has to be used on the last interval.

Part 2

Two important quantities when studying fermentation are the carbon dioxide evolution rate (g/h) and the oxygen uptake rate (g/h). These are calculated from expiremental analysis of the inlet and exit gases of the fermentor, and the flow rates, temperature, and pressure of these gases.

Using your function in part 1, and the data table below, calculate the total amount of carbon dioxide produced and oxygen consumed during fermentation. Compare to the value that the MATLAB function `trapz()` computes.

Time of Fermentation (h)	Carbon Dioxide Evolution Rate (g/h)	Oxygen Uptake Rate (g/h)
140	15.72	15.49
141	15.53	16.16
142	15.19	15.35
143	16.56	15.13
144	16.21	14.20

Time of Fermentation (h)	Carbon Dioxide Evolution Rate (g/h)	Oxygen Uptake Rate (g/h)
145	17.39	14.23
146	17.36	14.29
147	17.42	12.74
148	17.60	14.74
149	17.75	13.68