MECH105: Homework 20

Develop an M-file function that computes first and second derivative estimates of order $O(h^2)$ based on the formulas in Fig. 21.3 through Fig 21.5. The function's first line should be set up as

```
function [dydx, d2ydx2] = diffeq_lastname(x,y)
```

where `x` and `y` are input vectors of length `n` containing the values of the independent and dependent variables, respectively, and `dydx` and `d2ydx2` are output vectors of length `n` containing the first and second derivative estimates at each value of the independent variable. The function should generate a plot of `dydx` and `d2ydx2` versus `x`.

Your m file should return an error if

1. the input vectores are not the same length
2. the values of the independent variable are not equally spaced.

Testing

Note: YOU DO NOT NEED TO TURN THIS IN. IT IS FOR YOUR TESTING PURPOSES ONLY

The following data were collected for the distance traveled versus time for a rocket.

```
t = [0 25 50 75 100 125]
y = [0 32 58 78 92 100]
```

Where `t` is time in seconds and `y` is distance in km.

Your output should look like the following...

```
dydx = [1.4 1.16 0.92 0.68 0.44 0.2]
d2ydx2 = [-0.0096 -0.0096 -0.0096 -0.0096 -0.0096 -0.0096]
```