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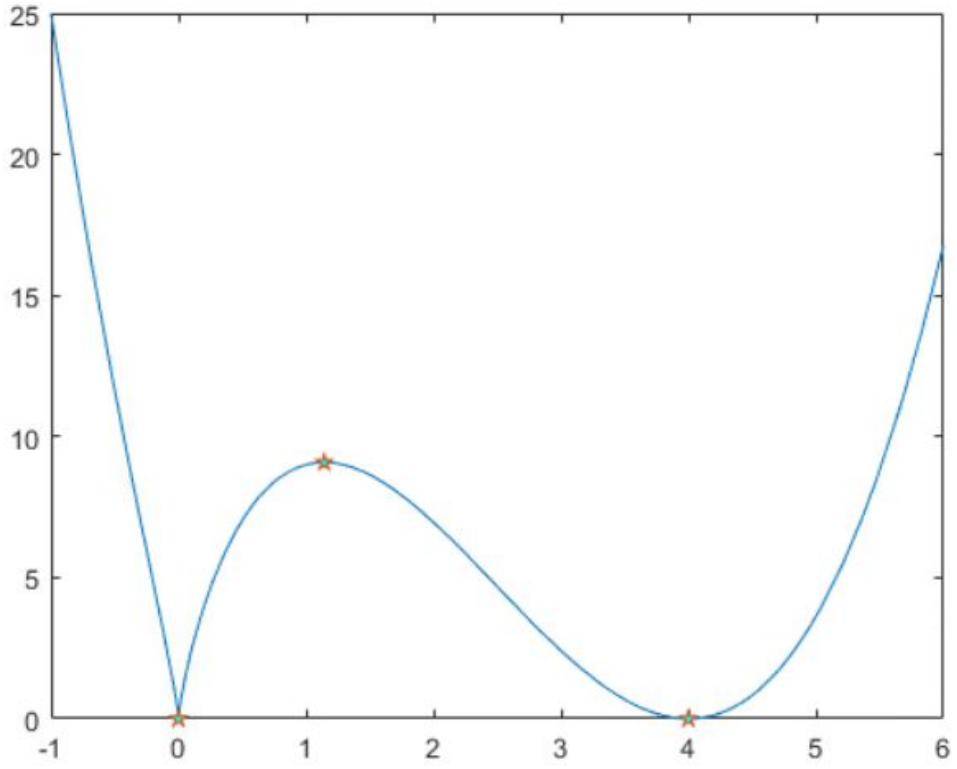
ENGR 102

Lab 12 Design Document

Problem: Develop a program that will use functions written by a user for the function and its derivatives together with a plotting range and will generate a plot of the curve, its first derivative curve, and its second derivative curve. All three curves should be plotted as subplots in the same figure window and using the same x-axes so that it is easy to see how the first and second derivatives derive from the shape of the base curve. Also, you are to highlight local maxima and minima by drawing points on the plots showing where these occur.

Sample picture: $f(x) = x^{4/5}(x-4)^2$ on interval (-1, 6)

The local extrema are highlighted with a star



Bottom-up Design:

A polynomial function for the equation

Takes in the x value as a float or int and the coefficients in a list

A derivative function provided by the user (optional)

Takes in the x value as a float or int and the coefficients in a list

A second derivative function provided by the user (optional)

Takes in the x value as a float or int and the coefficients in a list

Boolean variable (der) equals true if user enters a derivative and false if they don't

If der is true, a list (deriv) would hold the derivative functions

A user-defined function to plot

Takes in the equation of the function

Takes in optional derivative functions provided by the user

If no functions provided, use scipy.misc.derivative

Takes in the range lower bound

Takes in the range upper bound

1 list of x values within the range

Populate 3 different lists with 100 y values within the range for the function and its derivatives

Identify local extrema max() function and min()

Top-Down Flowchart: