ECSE 543: Assignment 3

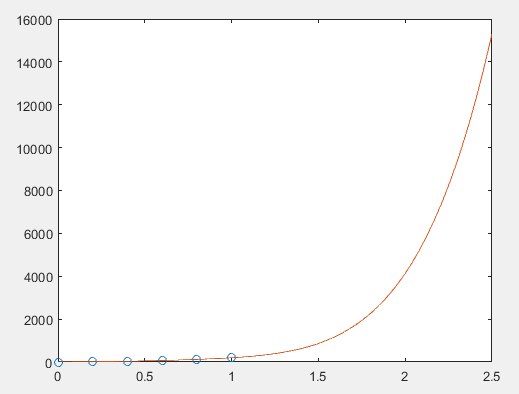
Razi Murshed

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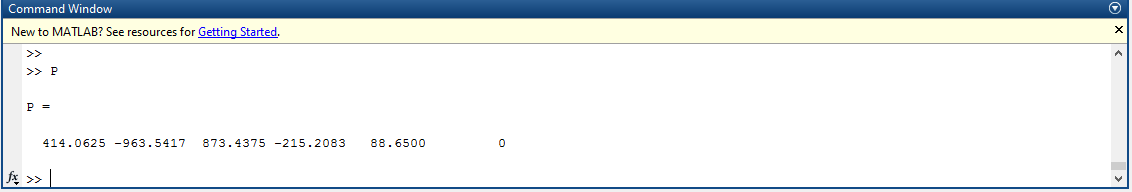
# Question 1

## Part A

The code for the interpolation of this polynomial was done by the function “Lagrange.m”. A plot of the 6 points passed into the function Lagrange is shown below –



The following polynomial is outputted when the points are run through the Lagrange function.

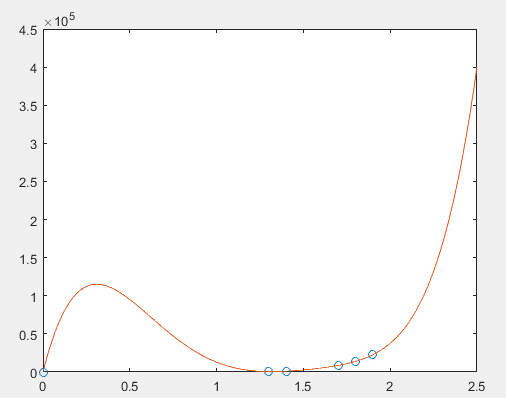


We get –

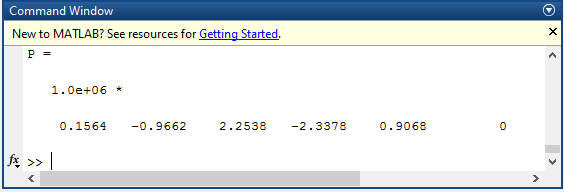
As the curve seems pretty smooth it seems like the result is plausible and is a good representation.

## Part b

When the function runs over the points B = [0, 1.3, 1.4, 1.7, 1.8, 1.9] we see the following plot –



The following polynomial was returned –

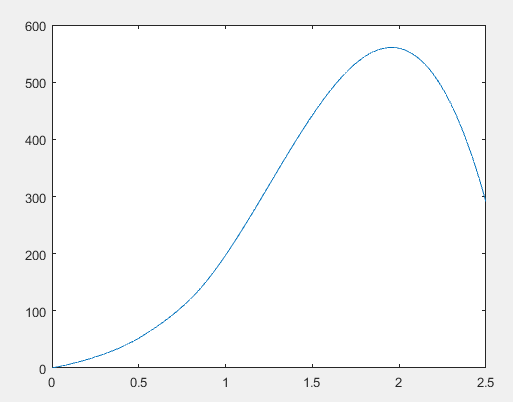


We get –

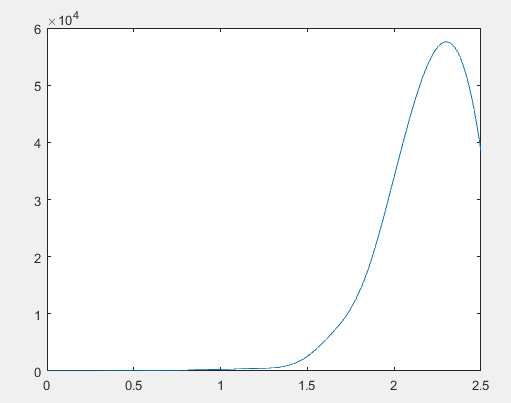
It can be seen that this graph does not look anything like a H versus B graph and therefore not a plausible representation.

## Part C

If we happen to know both function values and first derivative values at a set of data points, then piecewise cubic Hermite interpolation can reproduce those data. But since we are not given the derivative values, we need to define the slopes somehow. However, we would have to do this for two types of points, the edge points such as the start and end points and also for the internal points. For the internal points we calculate this by finding the differences in the x-axis and creating a delta by dividng the differences in the x points with the difference in the y-points. We can then use this delta along with the differences in the x-axis to form the slopes. For the end points we can find the slopes by interpolating using the deltas between the first and second points and the second last and last points using their deltas. The codes for cubic hermite interpolation can be found in ‘cubicHermiteInterpolation.m’ and ‘calculateSlopeInternal.m’. The following plot is found with B = [0.0, 0.2, 0.4, 0.6, 0.8, 1.0] –



For B = [0, 1.3, 1.4, 1.7, 1.8, 1.9] we get the following –



We can see that