Numerical Methods Homework 7

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1 Newtons Divided Difference

Given the data below

x	5	7	11	13	17
y	150	392	1452	2366	5202

we find that the polynomial

$f(x) = 150+121(x-5)+24(x-5)(x-7)+1(x-5)(x-7)(x-11)+0.001041(x-5)(x-7)(x-11)(x-13)$

represents the data. The plot can be seen in figure 1

2 Rocket Velocity Interpolation

Given the data below

t	0	10	15	16	20	25	27.5	30
v	0	227.04	362.78	??	517.35	701.35	??	901.67

we use newtons divided difference to obtain the incomplete values.

2.1 First Order

The first is found to be

$$v(t) = 22.704x$$

. We estimate $v(t = 16) = 363.264$

2.2 Second Order

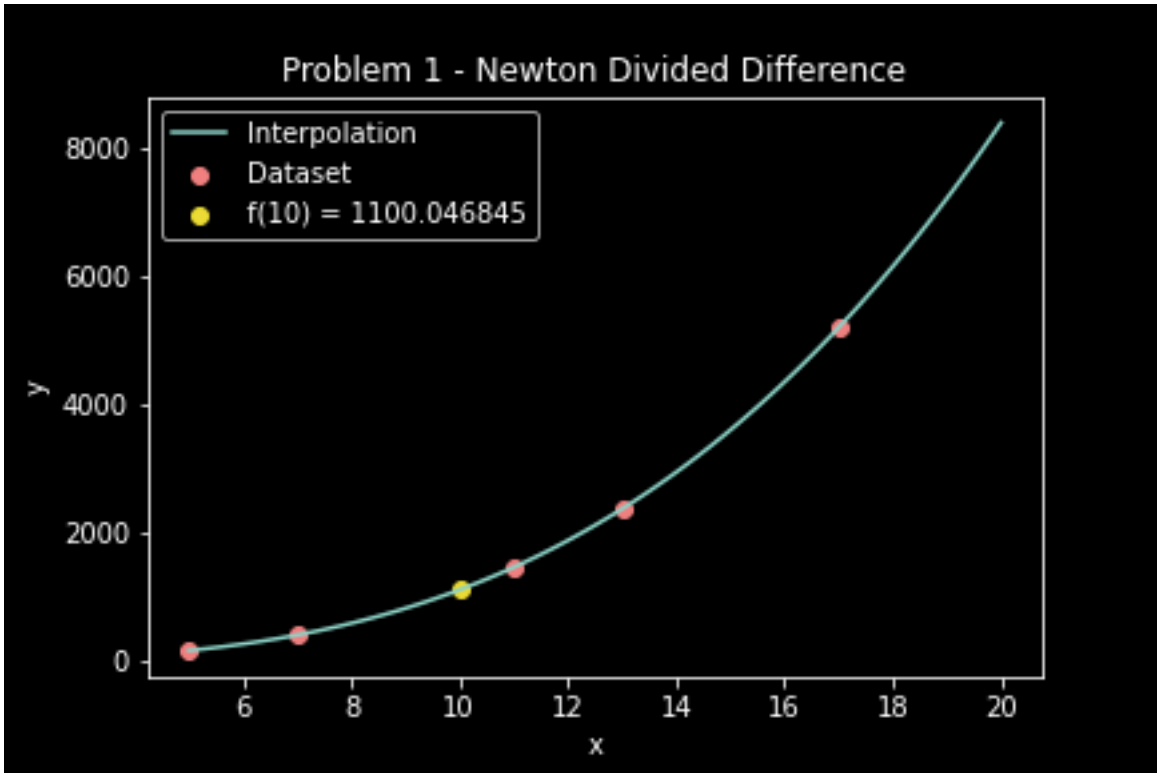
The second order is found to be

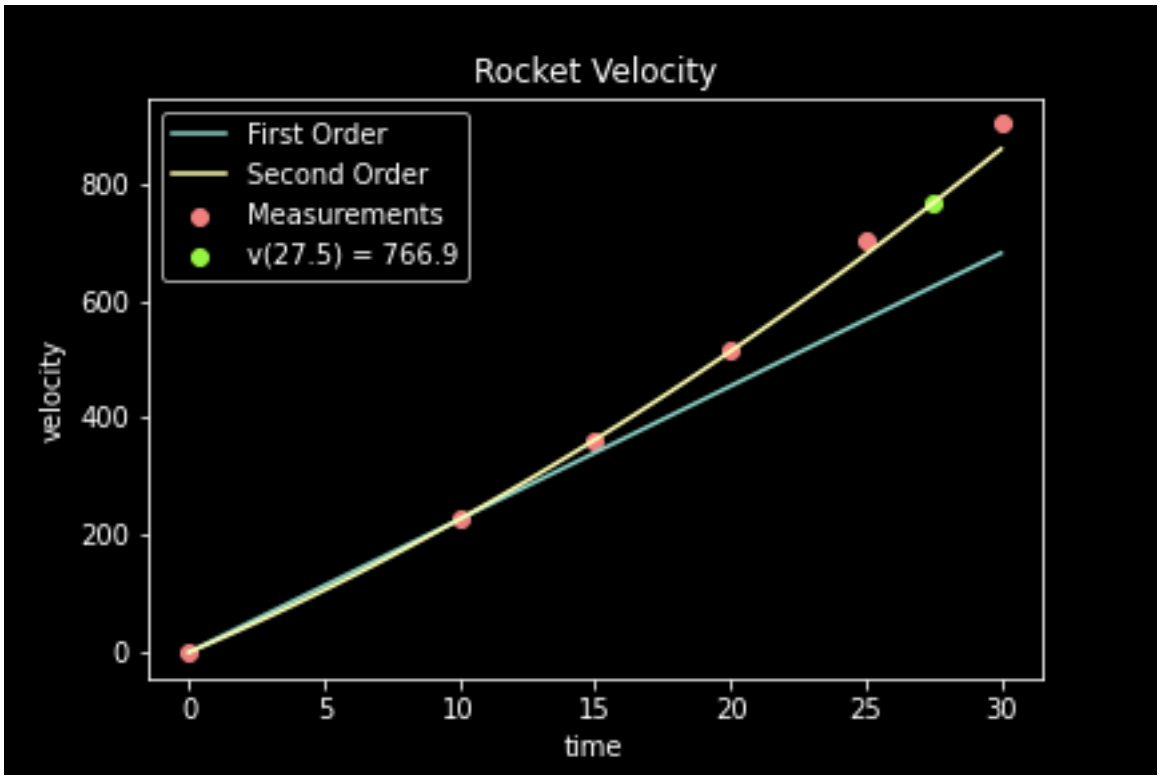
$$v(t) = 22.704x + 0.2962x(x - 10)$$

Thus $v(t = 16) = 391.7056$

2.3 Plot

The plot can be seen in Figure 2.3, and I would say that the second order is best to use here, however high order is probably even better. We estimate from the graph $v(27.5) \approx 766.9$. I hope t is in ms because this is a slow rocket.


Problem 1 - Newton Divided Difference
Interpolation
Dataset
f(10) = 1100.046845
8000
6000
4000
2000
0
y
6
8
10
12
14
16
18
20
x


Rocket Velocity
First Order
Second Order
Measurements
v(27.5) = 766.9
800
600
400
200
0
velocity
0
5
10
15
20
25
30
time