Q1.Input:

$$\frac{dy}{dx} = 5e^{-100(x-2)^2} - 0.5y$$

$x_0 = 0.0$

$y_0 = 0.5$

$x_f = 4.0$

$h = 0.2$

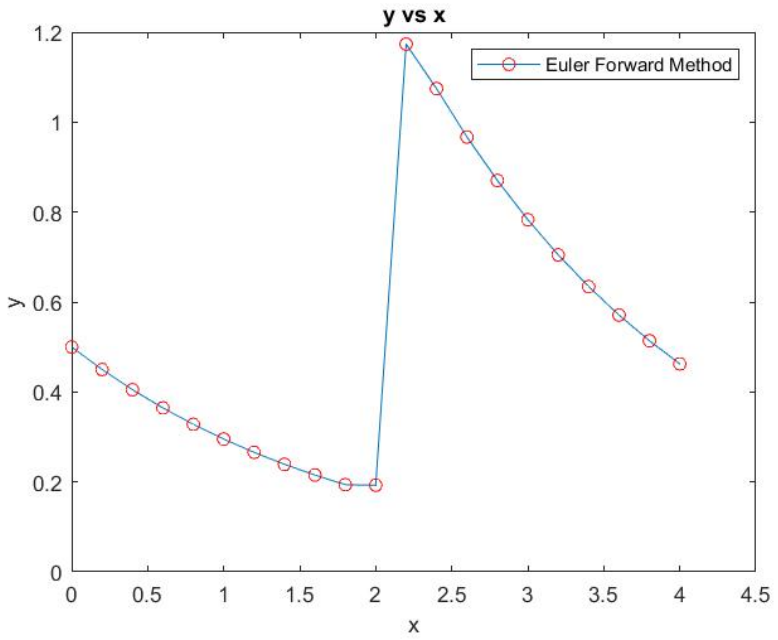
$h_{max} = 2.0$

$\alpha = 0.25$

$tol = 10^{-5}$

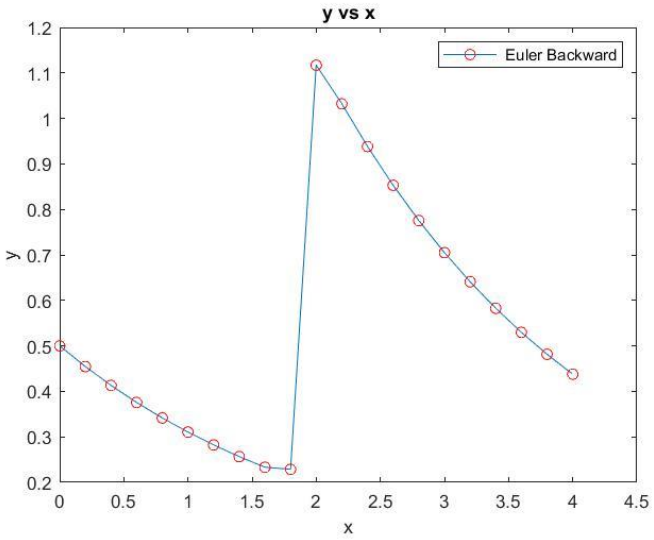
1. Euler Forward

x	y
0.000000	0.500000
0.200000	0.450000
0.400000	0.405000
0.600000	0.364500
0.800000	0.328050
1.000000	0.295245
1.200000	0.265721
1.400000	0.239148
1.600000	0.215234
1.800000	0.193710
2.000000	0.192655
2.200000	1.173389
2.400000	1.074366
2.600000	0.966930
2.800000	0.870237
3.000000	0.783213
3.200000	0.704892
3.400000	0.634403
3.600000	0.570962
3.800000	0.513866
4.000000	0.462479



2. Euler Backward

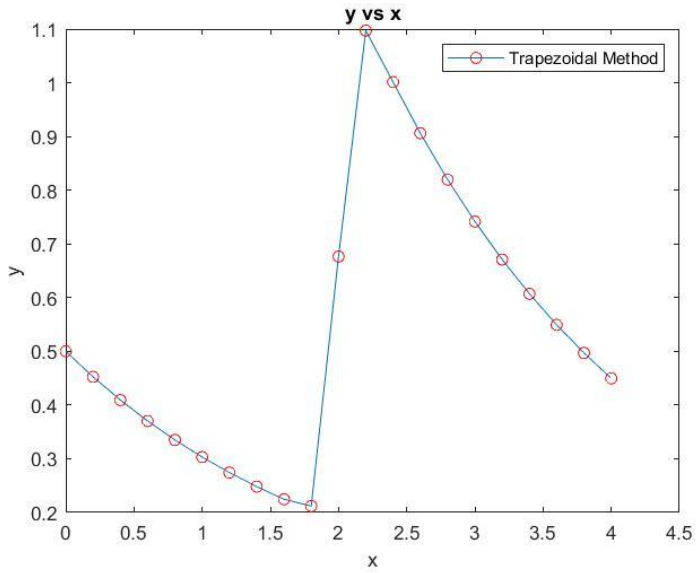
x	y
0.000000	0.500000
0.200000	0.454545
0.400000	0.413223
0.600000	0.375657
0.800000	0.341507
1.000000	0.310461
1.200000	0.282237
1.400000	0.256579
1.600000	0.233254
1.800000	0.228699
2.000000	1.117000
2.200000	1.032105
2.400000	0.938277
2.600000	0.852979
2.800000	0.775436
3.000000	0.704941
3.200000	0.640856
3.400000	0.582596
3.600000	0.529633
3.800000	0.481485
4.000000	0.437713



3. Trapezoidal

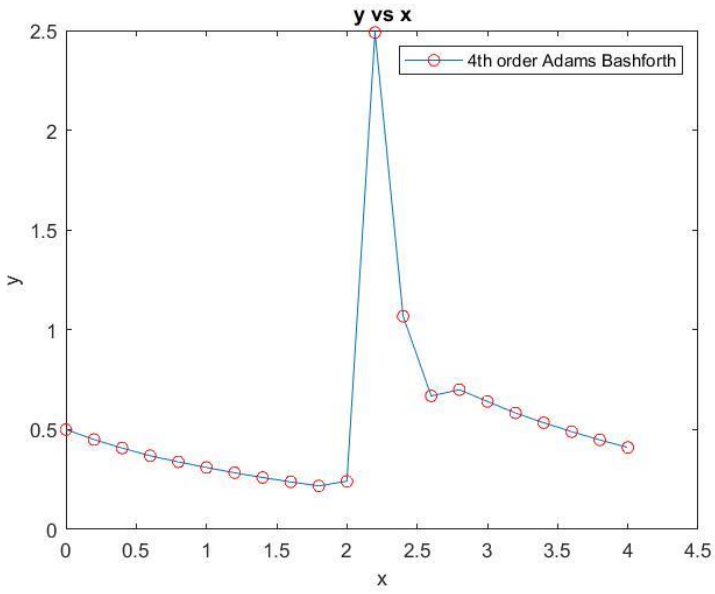
x	y
0.000000	0.500000
0.200000	0.452381
0.400000	0.409297
0.600000	0.370316
0.800000	0.335048
1.000000	0.303139
1.200000	0.274268
1.400000	0.248148
1.600000	0.224515
1.800000	0.211854
2.000000	0.676590

2.200000	1.097065
2.400000	1.001304
2.600000	0.905942
2.800000	0.819662
3.000000	0.741599
3.200000	0.670970
3.400000	0.607068
3.600000	0.549252
3.800000	0.496943
4.000000	0.449615



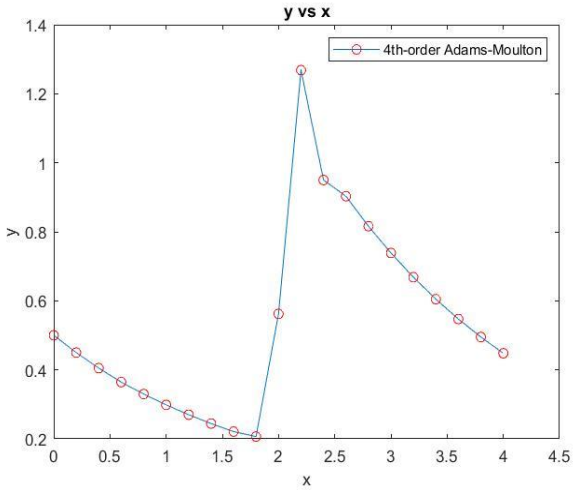
4.4th order Adams Bashforth

x	y
0.000000	0.500000
0.200000	0.450000
0.400000	0.407500
0.600000	0.368562
0.800000	0.338329
1.000000	0.309862
1.200000	0.283686
1.400000	0.259766
1.600000	0.237861
1.800000	0.217802
2.000000	0.241407
2.200000	2.489847
2.400000	1.067992
2.600000	0.668743
2.800000	0.699890
3.000000	0.640849
3.200000	0.583223
3.400000	0.534558
3.600000	0.489549
3.800000	0.448233
4.0	.410434



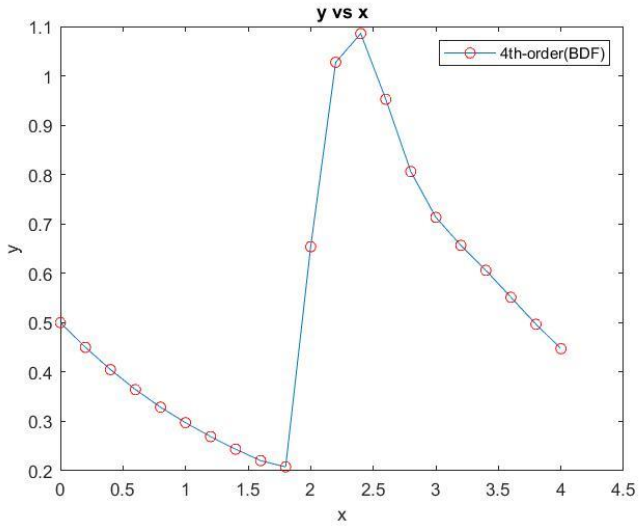
5.4th order Adams Moulton

x	y
0.000000	0.500000
0.200000	0.450000
0.400000	0.405000
0.600000	0.364500
0.800000	0.329837
1.000000	0.298440
1.200000	0.270040
1.400000	0.244342
1.600000	0.221090
1.800000	0.206670
2.000000	0.562310
2.200000	1.268335
2.400000	0.950081
2.600000	0.902937
2.800000	0.816122
3.000000	0.738665
3.200000	0.668364
3.400000	0.604762
3.600000	0.547211
3.800000	0.495137
4.000000	0.448018



6. 4th order BDF

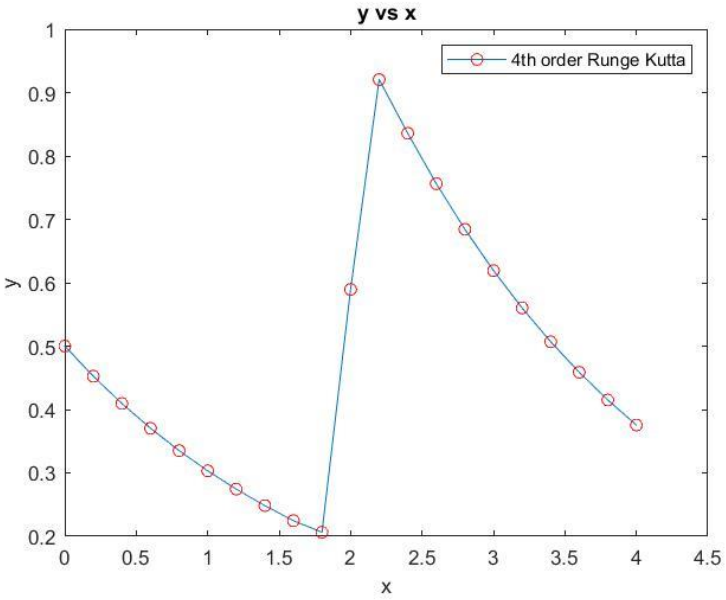
x	y
0.000000	0.500000
0.200000	0.450000
0.400000	0.405000
0.600000	0.364500
0.800000	0.328855
1.000000	0.297444
1.200000	0.269296
1.400000	0.243755
1.600000	0.220539
1.800000	0.207897
2.000000	0.653887
2.200000	1.027459
2.400000	1.085604
2.600000	0.952633
2.800000	0.806195
3.000000	0.713354
3.200000	0.656614
3.400000	0.606028
3.600000	0.551387
3.800000	0.496768
4.000000	0.447387



7. 4th order Runge Kutta

x	y
0.000000	0.500000
0.200000	0.452419
0.400000	0.409365
0.600000	0.370409
0.800000	0.335160
1.000000	0.303265
1.200000	0.274406
1.400000	0.248293
1.600000	0.224665
1.800000	0.206416
2.000000	0.589498
2.200000	0.920541
2.400000	0.835780

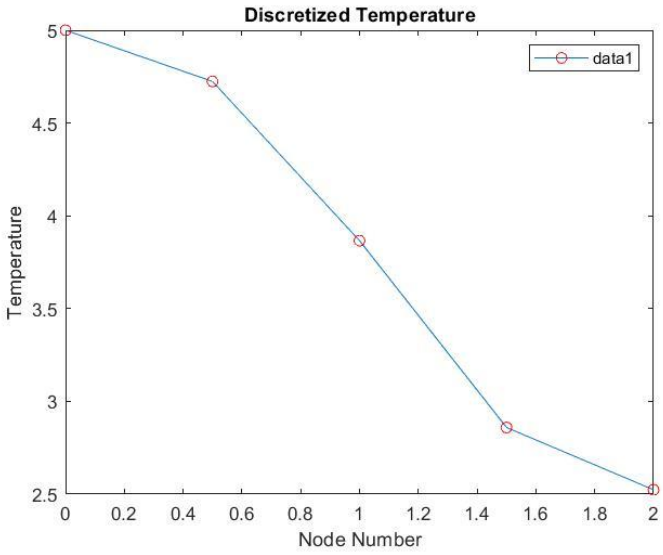
2.600000	0.756245
2.800000	0.684279
3.000000	0.619162
3.200000	0.560241
3.400000	0.506927
3.600000	0.458686
3.800000	0.415037
4.000000	0.375541



Q2.

1. 2nd order backward difference

x	y
0.000000	5.000000
0.500000	4.723972
1.000000	3.866024
1.500000	2.859169



2. 2nd order central difference

x	y
0.000000	5.000000
0.500000	4.687932
1.000000	3.726669
1.500000	2.479547
2.000000	1.634737