ESO208A

Programming Assignment 4

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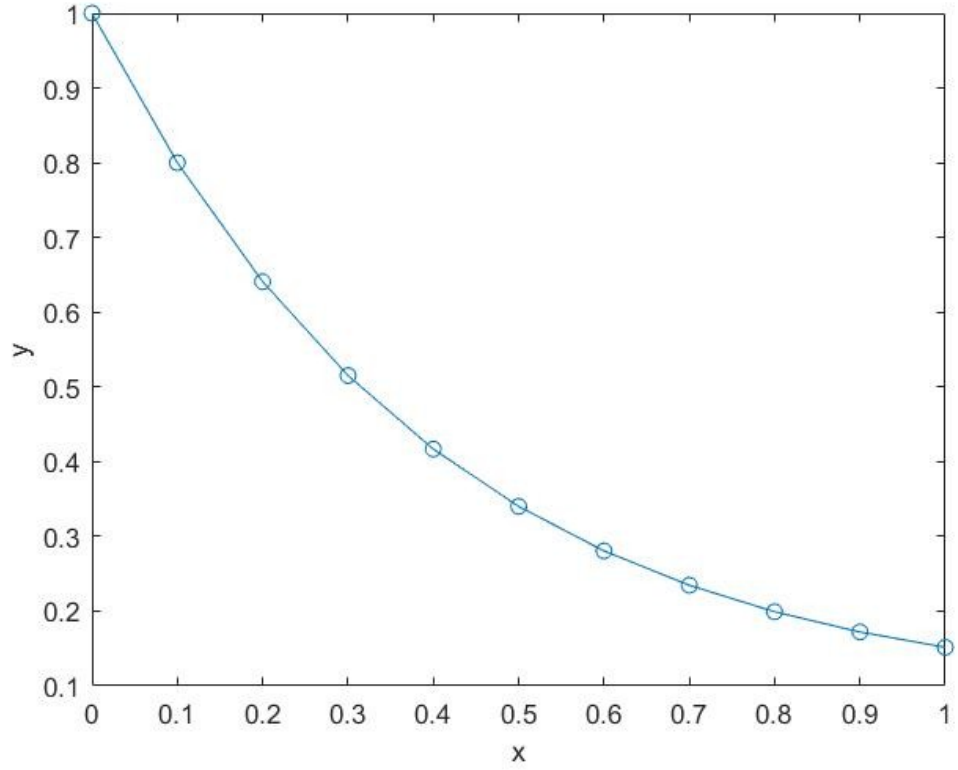
Question 1

1.1 Test Problem 1

Input :
(x)^2*(y)-2*(y)
x0 = 0
y0 = 1
xf = 1
h = 0.1

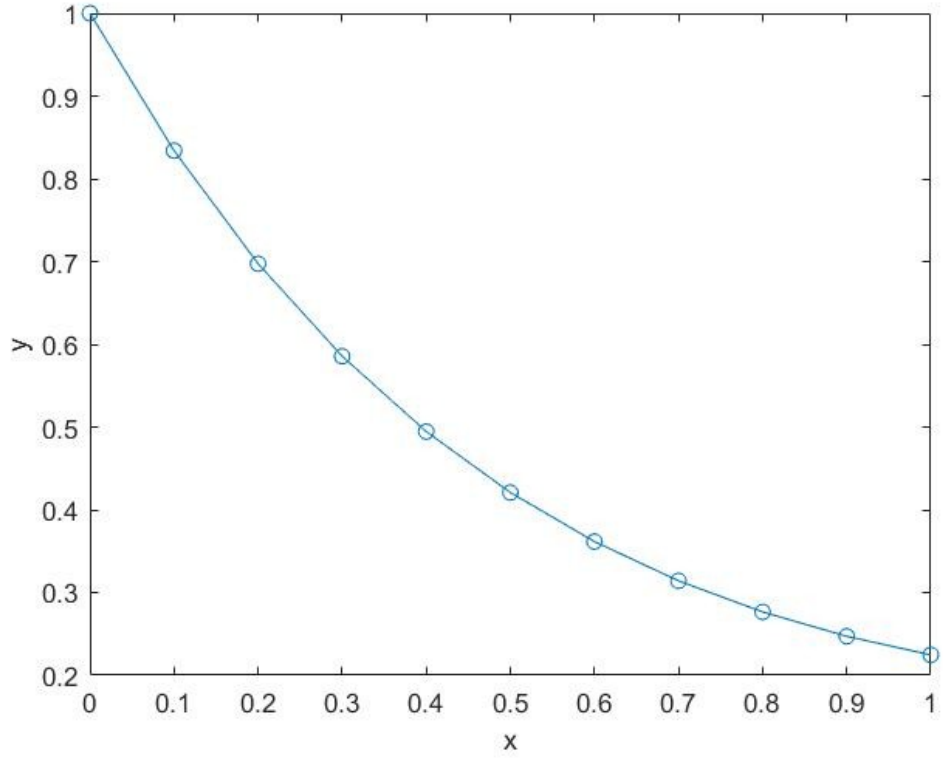
Euler-Forward

x	y
0.000000	1.000000
0.100000	0.800000
0.200000	0.640800
0.300000	0.515203
0.400000	0.416799
0.500000	0.340108
0.600000	0.280589
0.700000	0.234573
0.800000	0.199152
0.900000	0.172068
1.000000	0.151591



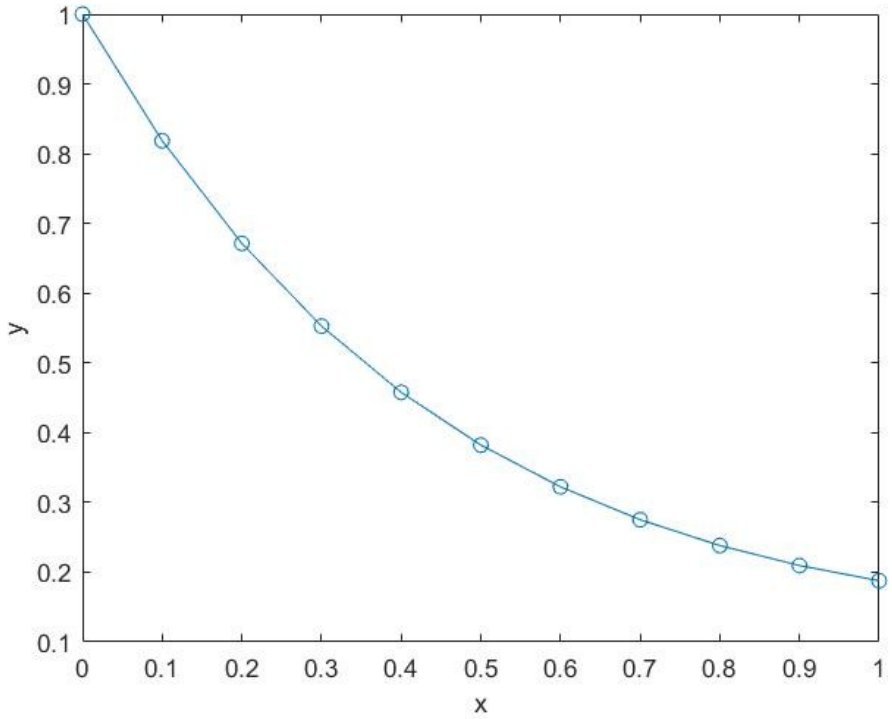
Euler-Backward

x	y
0.000000	1.000000
0.100000	0.834028
0.200000	0.697348
0.300000	0.585515
0.400000	0.494523
0.500000	0.420870
0.600000	0.361572
0.700000	0.314138
0.800000	0.276530
0.900000	0.247122
1.000000	0.224656



Trapezoidal

x	y
0.000000	1.000000
0.100000	0.818554
0.200000	0.671319
0.300000	0.552742
0.400000	0.457835
0.500000	0.382266
0.600000	0.322382
0.700000	0.275171
0.800000	0.238198
0.900000	0.209534
1.0	187682



1.2 Test Problem 2

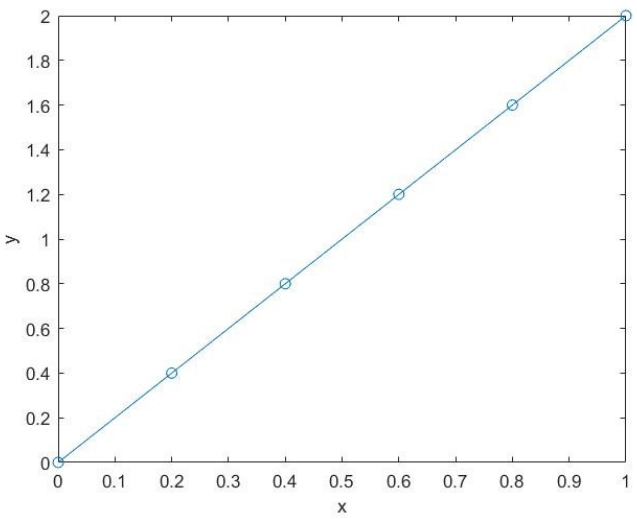
Input :
2 - 1.5*y
x0 = 0
y0 = 0
xf = 1
h = 0.2

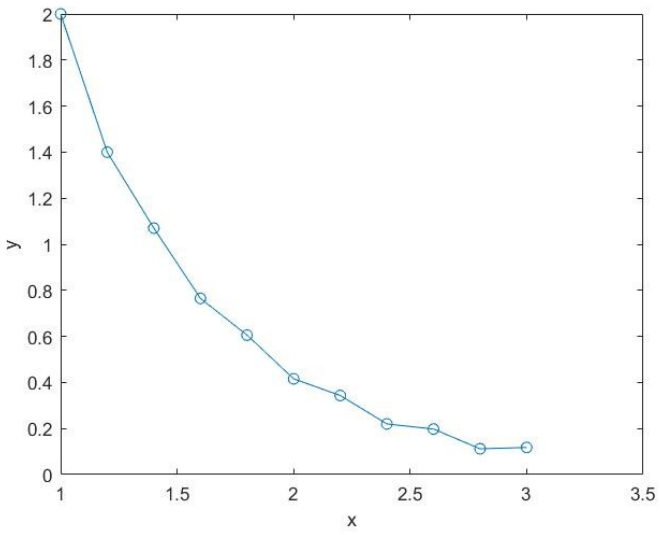
&&

2 - 1.5*y
x0 = 1
y0 = 2
xf = 3
h = 0.2

Adams-Bashforth

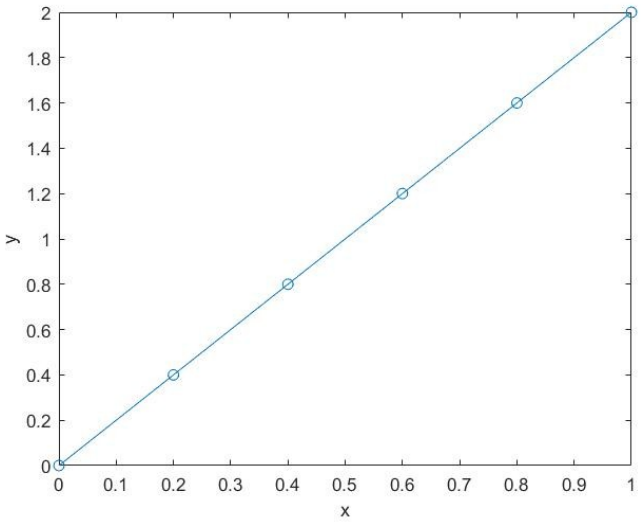
x	y
0.000000	0.000000
0.200000	0.400000
0.400000	0.800000
0.600000	1.200000
0.800000	1.600000
1.000000	2.000000
1.200000	1.400000
1.400000	1.070000
1.600000	0.764750
1.800000	0.605609
2.000000	0.415881
2.200000	0.343278
2.400000	0.219927
2.600000	0.197681
2.800000	0.111992
3.000000	0.117690

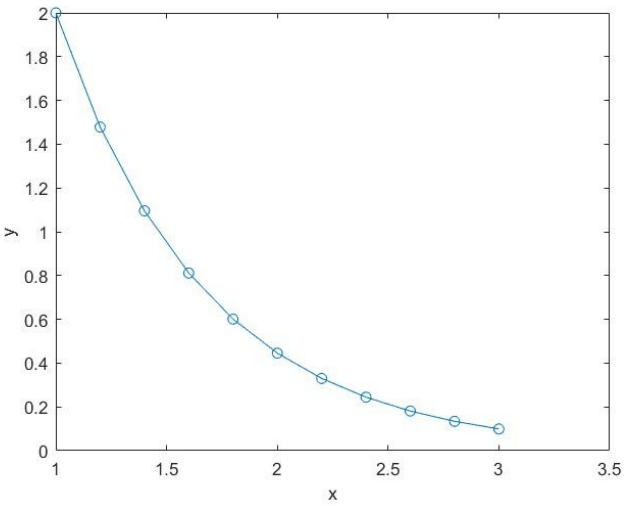




Adams-Moulton

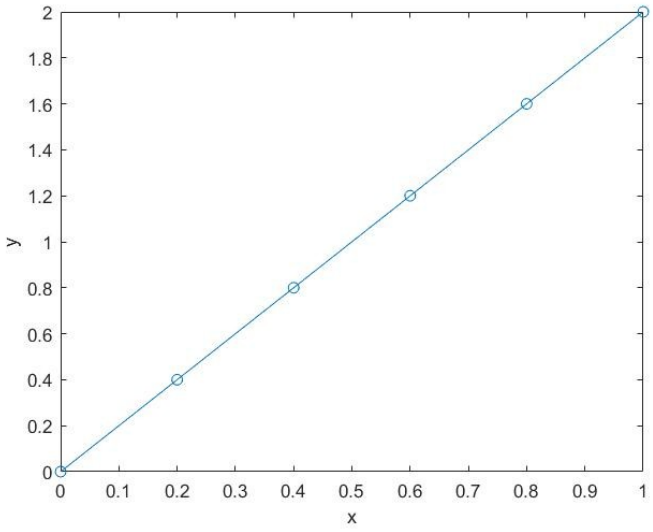
x	y
0.000000	0.000000
0.200000	0.400000
0.400000	0.800000
0.600000	1.200000
0.800000	1.600000
1.000000	2.000000
1.200000	1.478261
1.400000	1.095652
1.600000	0.811529
1.800000	0.601160
2.000000	0.445312
2.200000	0.329869
2.400000	0.244353
2.600000	0.181006
2.800000	0.134082
3.000000	0.099322

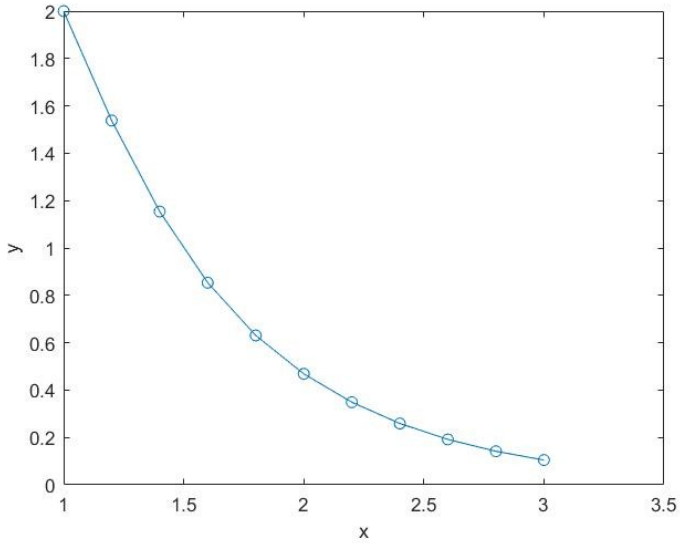




4th – order BDF

x	y
0.000000	0.000000
0.200000	0.400000
0.400000	0.800000
0.600000	1.200000
0.800000	1.600000
1.000000	2.000000
1.200000	1.538462
1.400000	1.153846
1.600000	0.853365
1.800000	0.630715
2.000000	0.468508
2.200000	0.348775
2.400000	0.258959
2.600000	0.191543
2.800000	0.141483
3.000000	0.104638





1.3 Test Problem 3

Input :

0.6*exp(-0.05*x) - 0.02*y

x0 = 0

y0 = 3

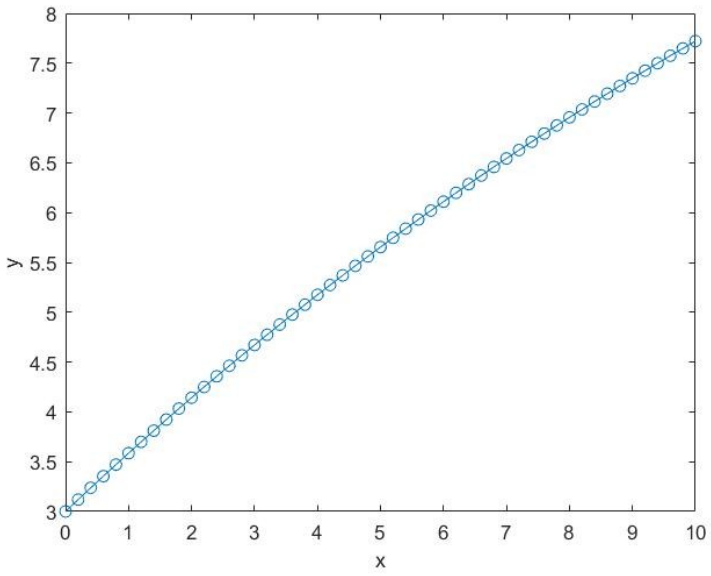
xf = 10

h = 0.2

4th – order Runge-Kutta

x	y
0.000000	3.000000
0.200000	3.119402
0.400000	3.237616
0.600000	3.354654
0.800000	3.470527
1.000000	3.585247
1.200000	3.698826
1.400000	3.811274
1.600000	3.922604
1.800000	4.032826
2.000000	4.141951
2.200000	4.249990
2.400000	4.356955
2.600000	4.462855
2.800000	4.567701
3.000000	4.671504
3.200000	4.774275
3.400000	4.876022
3.600000	4.976757
3.800000	5.076490
4.000000	5.175231
4.200000	5.272989
4.400000	5.369774
4.600000	5.465597
4.800000	5.560466
5.000000	5.654391
5.200000	5.747381
5.400000	5.839446
5.600000	5.930595
5.800000	6.020837
6.000000	6.110181
6.200000	6.198637
6.400000	6.286212

6.600000 6.372915
6.800000 6.458756
7.000000 6.543743
7.200000 6.627884
7.400000 6.711188
7.600000 6.793663
7.800000 6.875318
8.000000 6.956159
8.200000 7.036197
8.400000 7.115438
8.600000 7.193891
8.800000 7.271563
9.000000 7.348462
9.200000 7.424596
9.400000 7.499973
9.600000 7.574599
9.800000 7.648483
10.000000 7.721632



Question 2

Second Order Backward Difference Method

Enter the grid size : 0.5
Enter a for second order backward difference or b for ghost node : a

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x	Temperature
0	5
0.500000	4.723972
1.000000	3.866024
1.500000	2.859169
2.000000	2.523551

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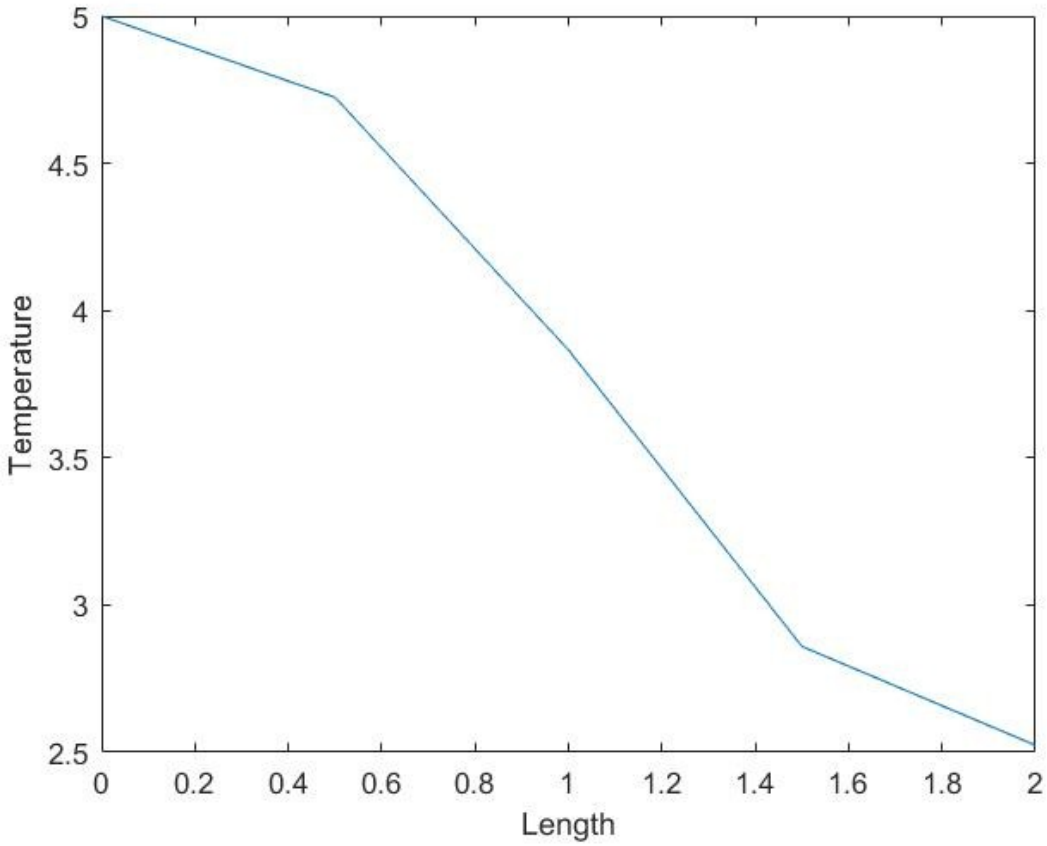

Ghost Node

Enter the grid size : 0.5
Enter a for second order backward difference or b for ghost node : b
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x	Temperature
0	5
0.500000	4.687932
1.000000	3.726669
1.500000	2.479547
2.000000	1.634737

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