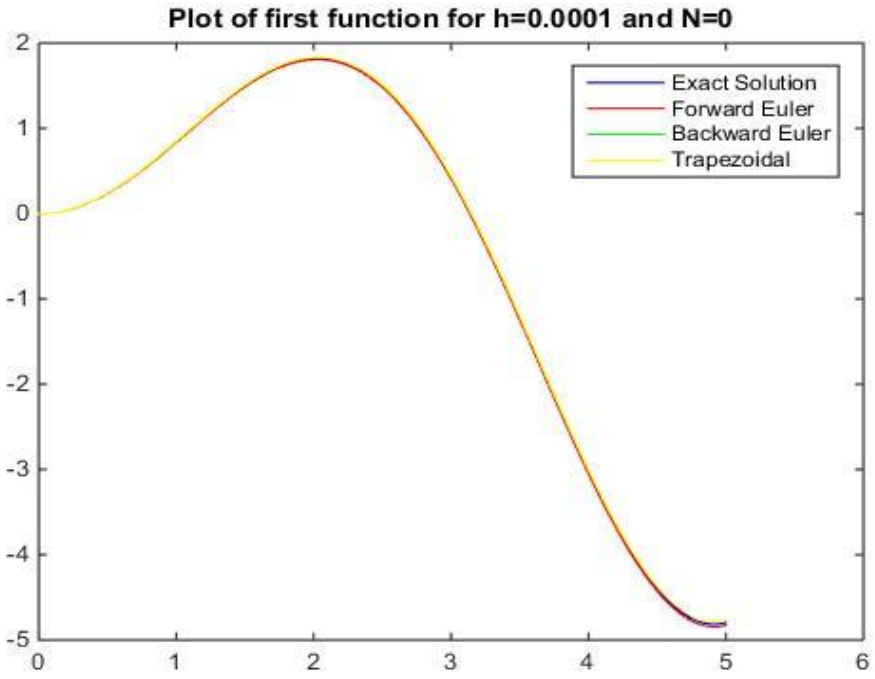
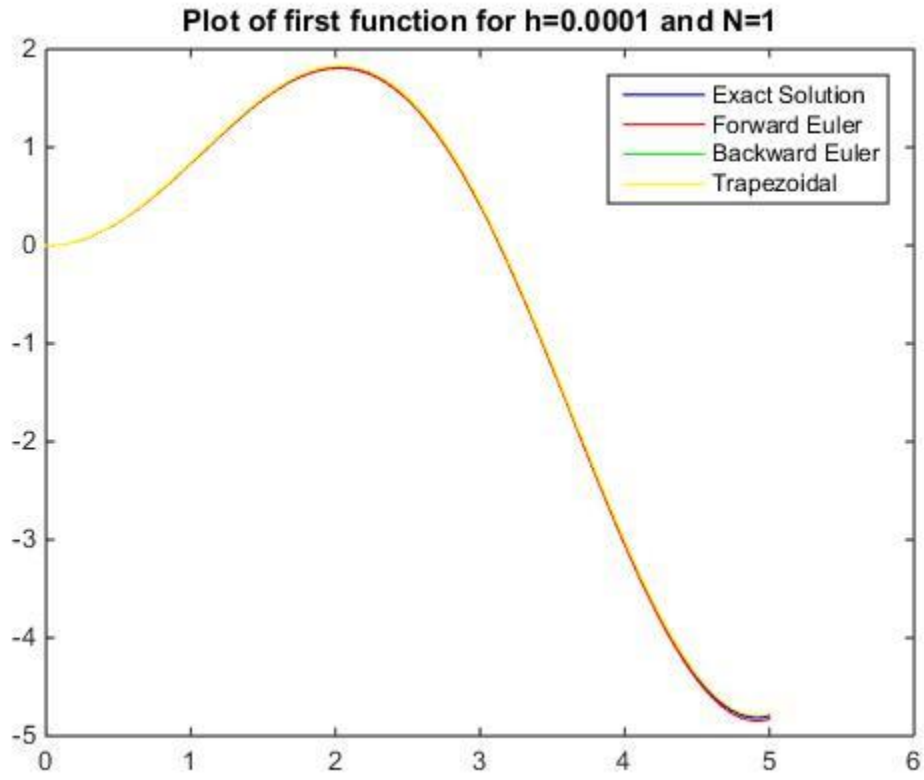
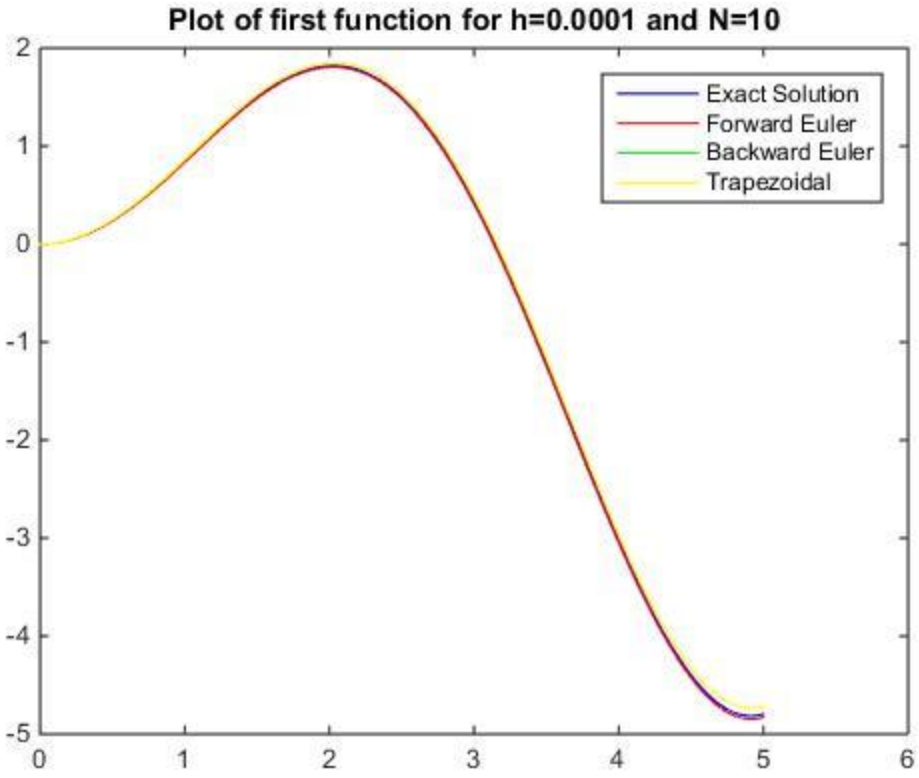
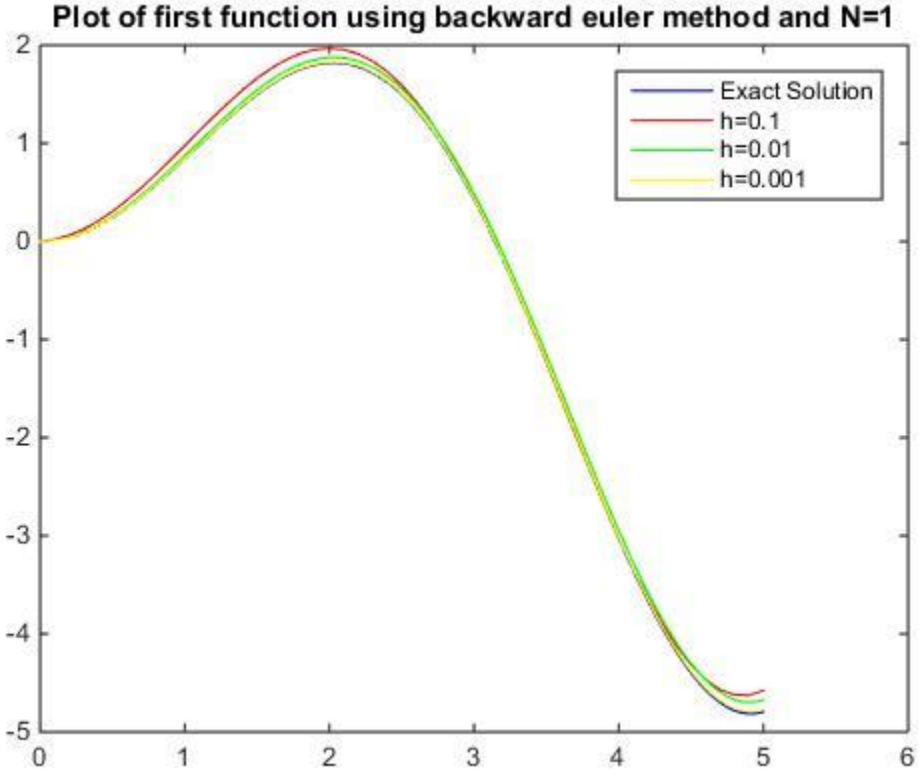
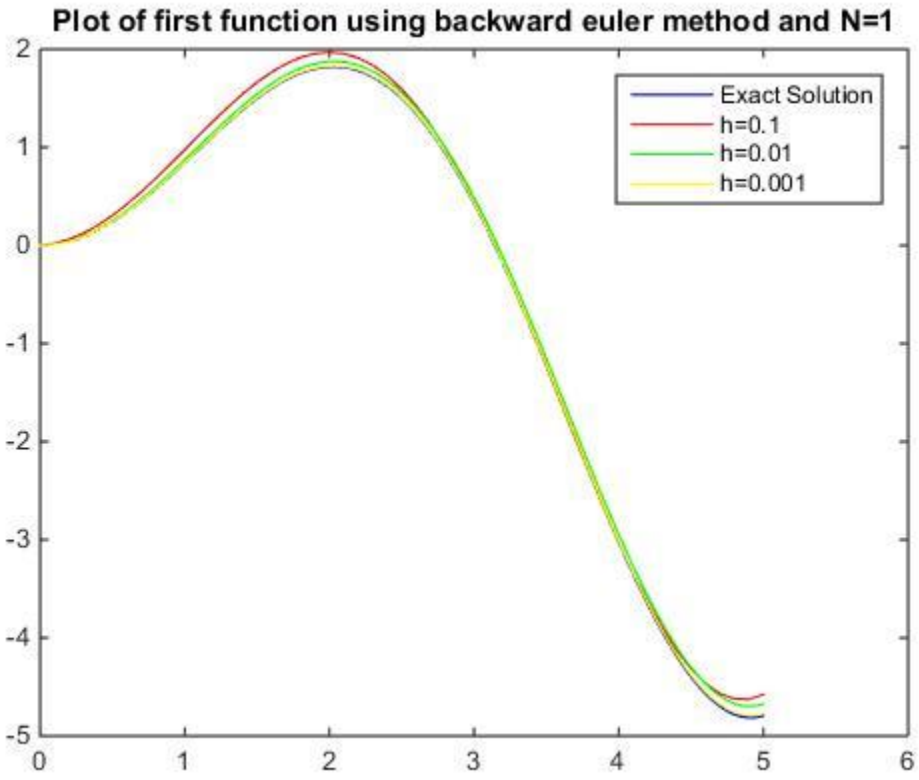
Assignment 6 – 120100093 Prabhakar Pal

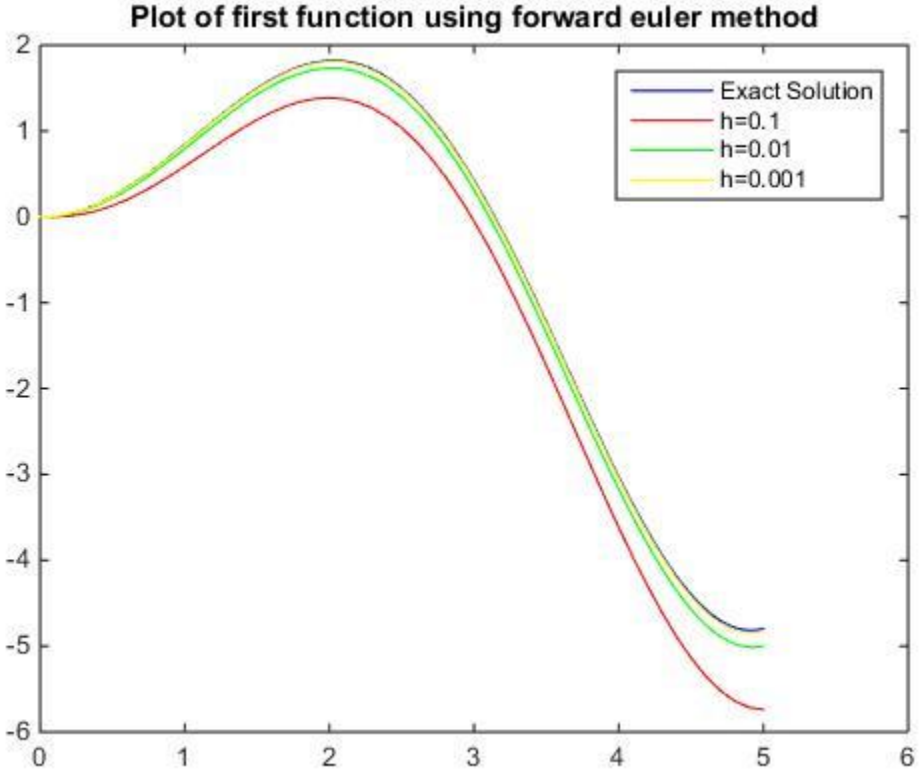


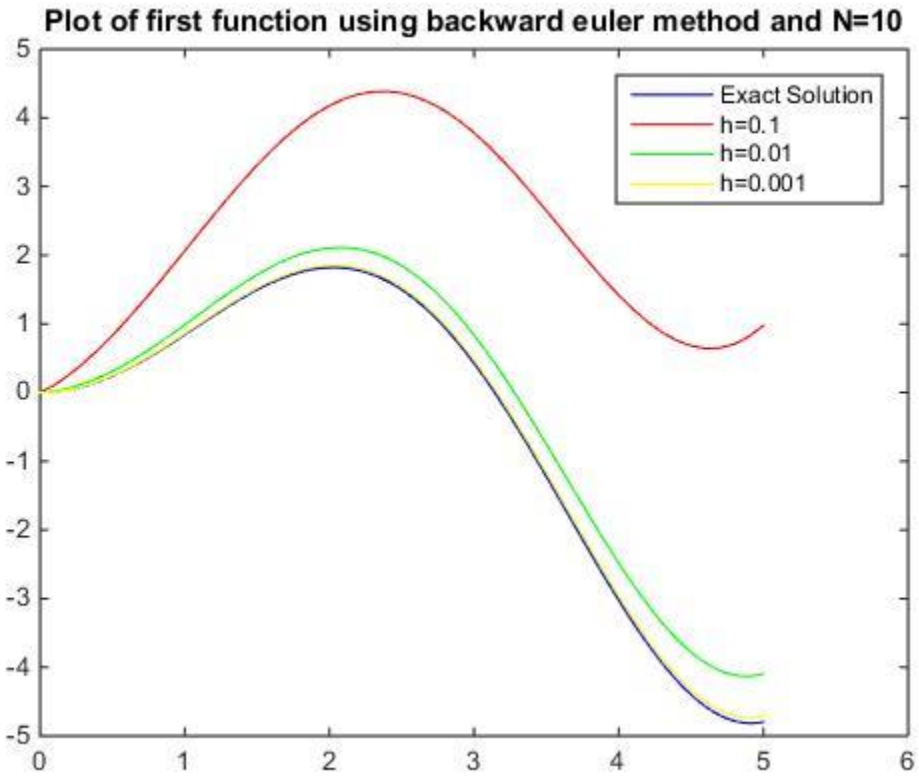


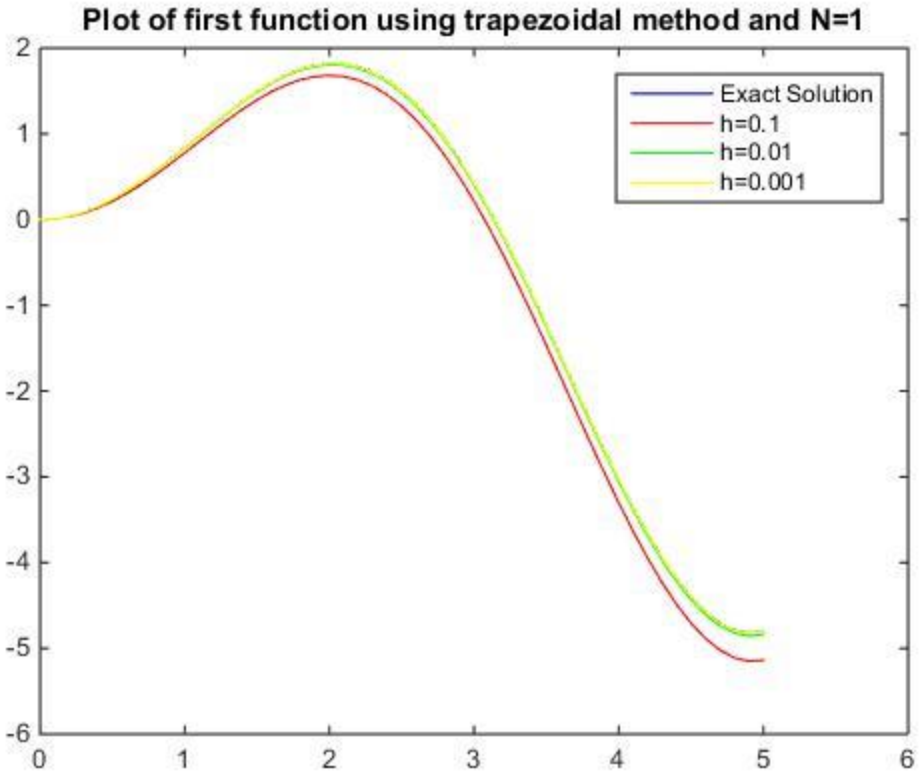

Plot of first function for h=0.0001 and N=10
Exact Solution
Forward Euler
Backward Euler
Trapezoidal
2
1
0
-1
-2
-3
-4
-5
0
1
2
3
4
5
6

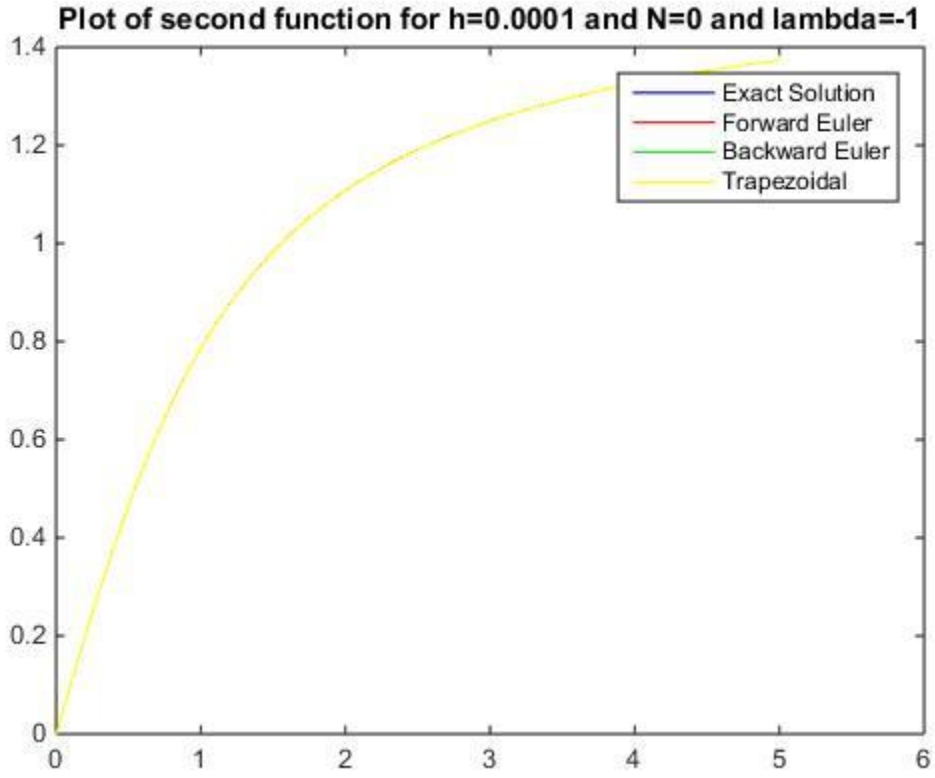

Plot of first function using backward euler method and N=1
Exact Solution
h=0.1
h=0.01
h=0.001
2
1
0
-1
-2
-3
-4
-5
0
1
2
3
4
5
6

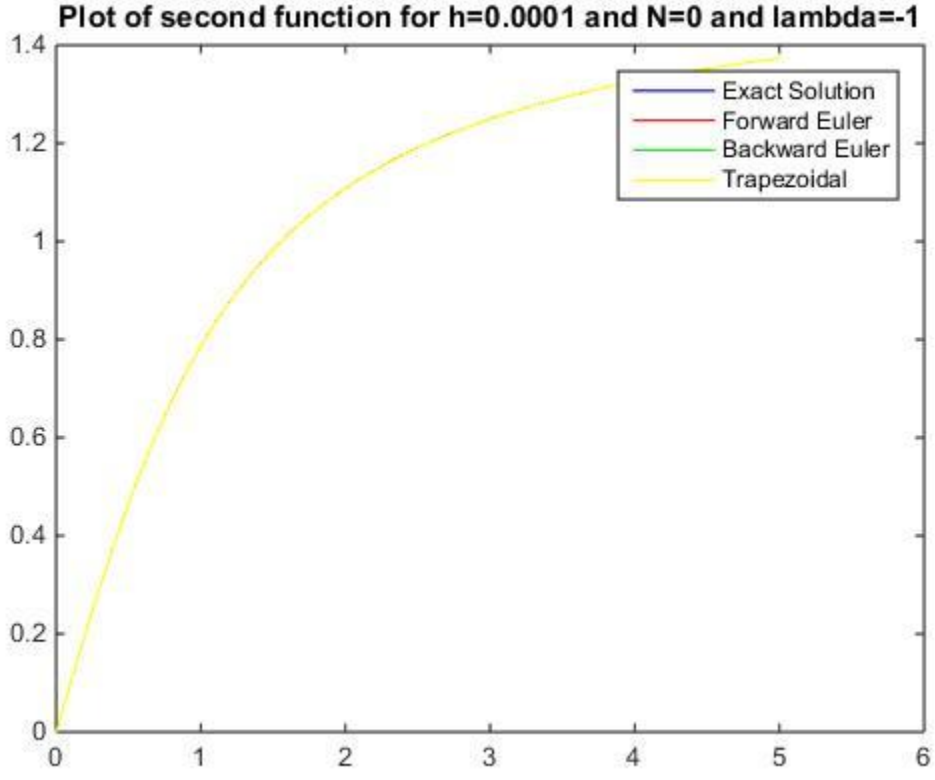

Plot of first function using backward euler method and N=1
Exact Solution
h=0.1
h=0.01
h=0.001
2
1
0
-1
-2
-3
-4
-5
0
1
2
3
4
5
6

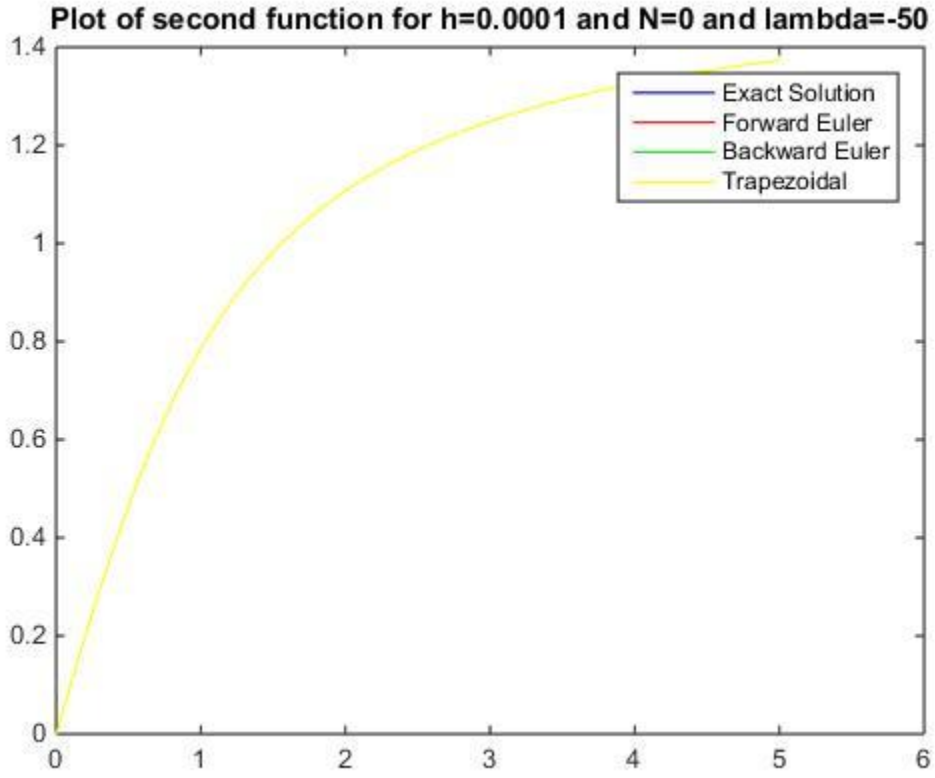

Plot of first function using forward euler method
Exact Solution
h=0.1
h=0.01
h=0.001
2
1
0
-1
-2
-3
-4
-5
-6
0
1
2
3
4
5
6

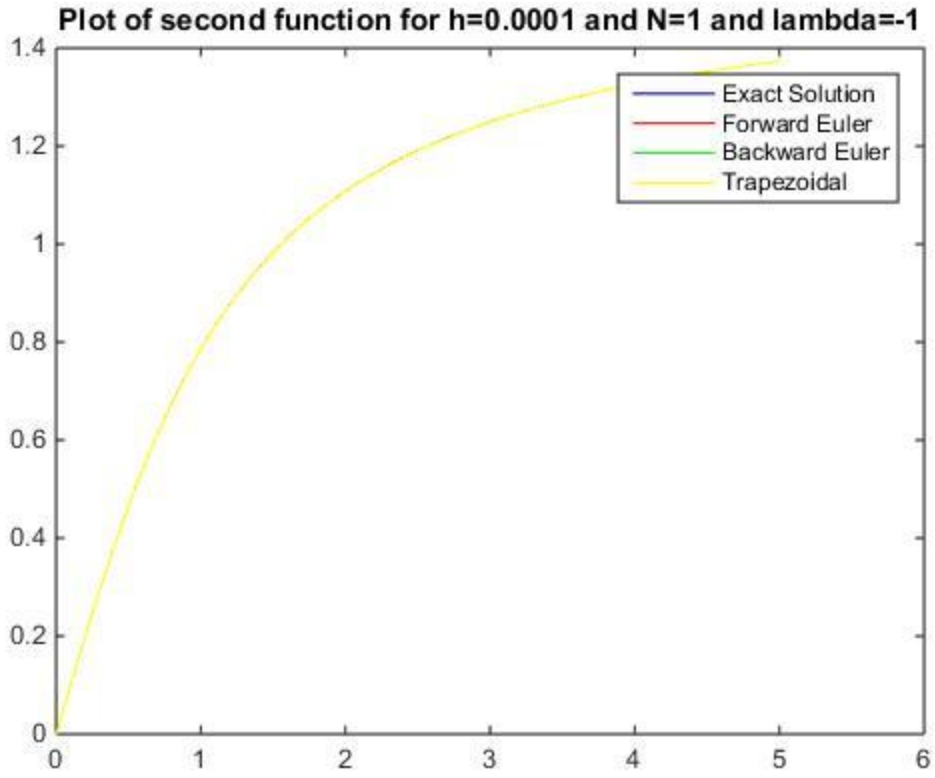

Plot of first function using backward euler method and N=10
Exact Solution
h=0.1
h=0.01
h=0.001
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
1
2
3
4
5
6

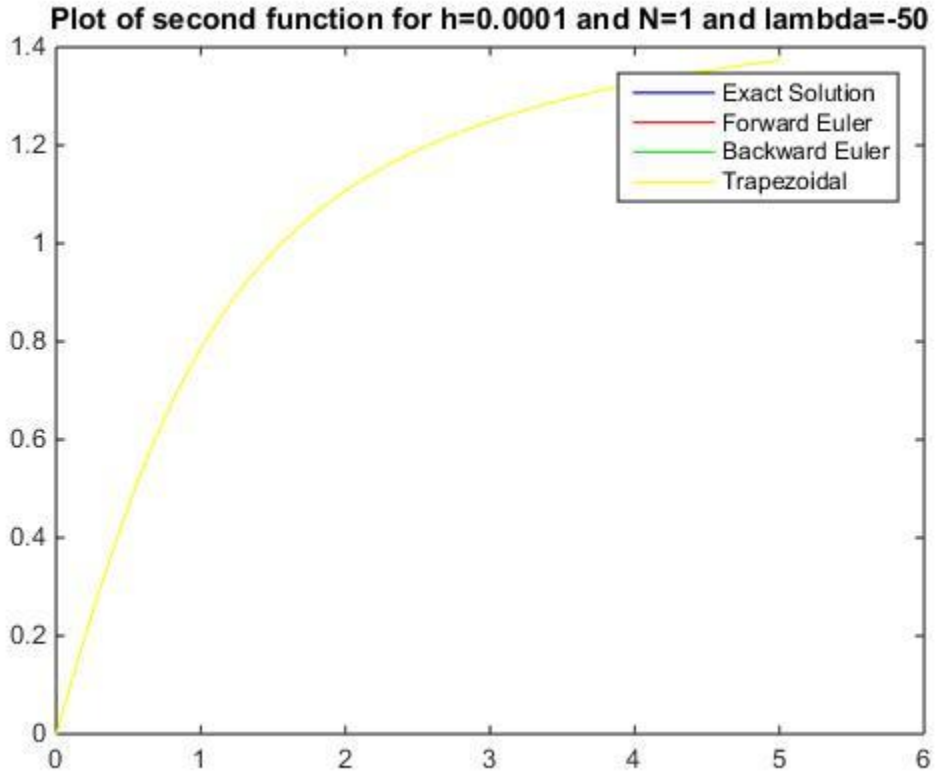

Plot of first function using trapezoidal method and N=1
Exact Solution
h=0.1
h=0.01
h=0.001
2
1
0
-1
-2
-3
-4
-5
-6
0
1
2
3
4
5
6

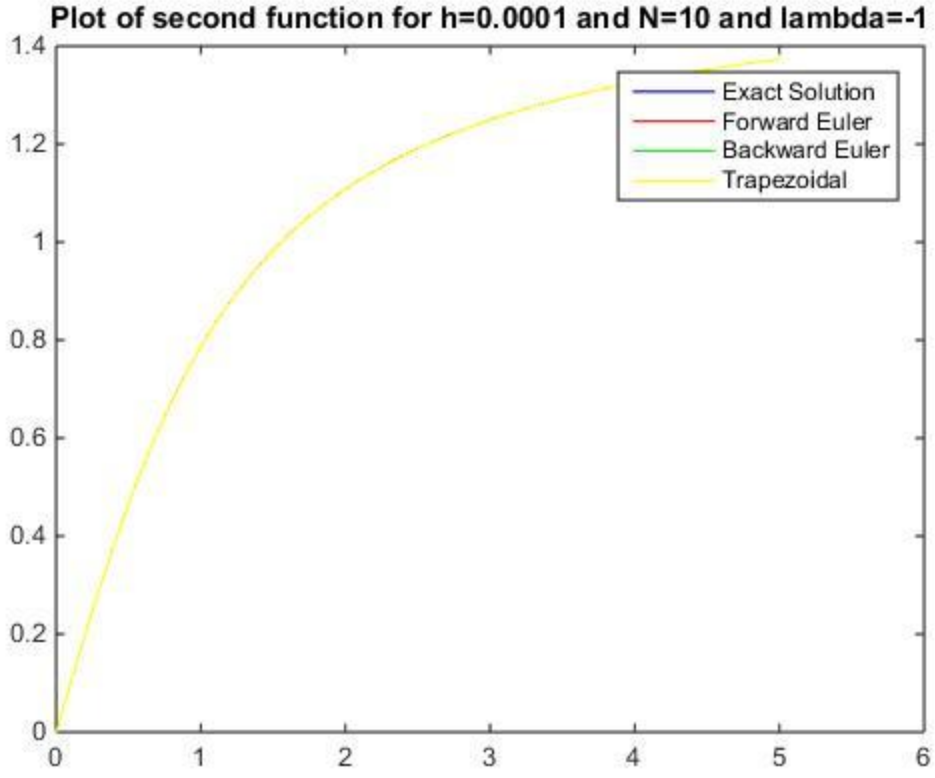

Plot of second function for h=0.0001 and N=0 and lambda=-1
Exact Solution
Forward Euler
Backward Euler
Trapezoidal
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6

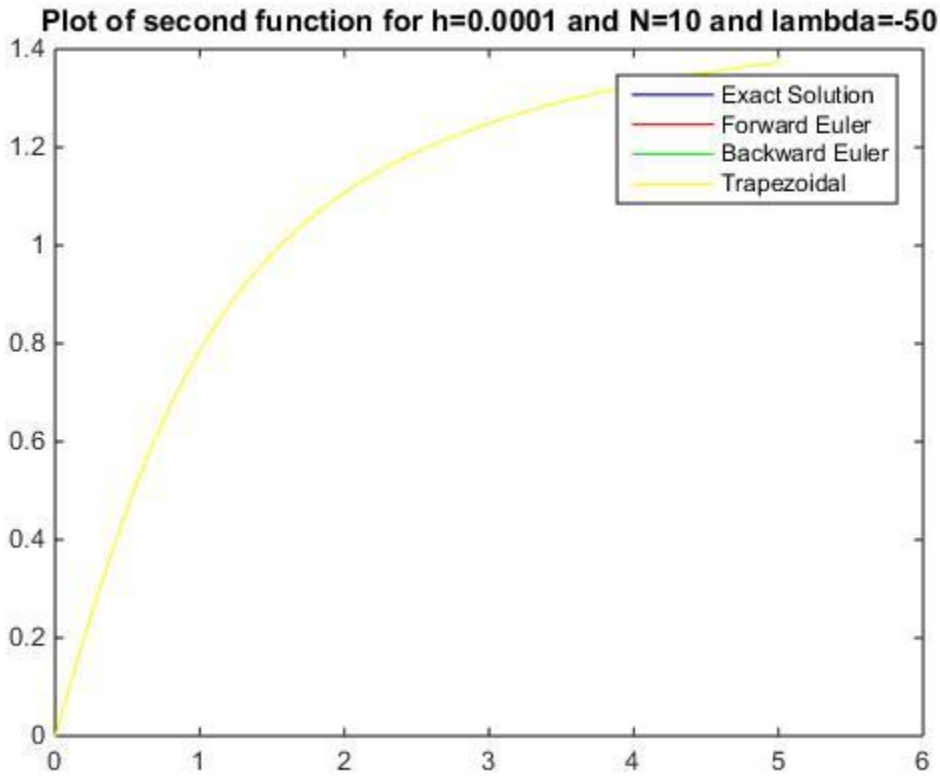

Plot of second function for h=0.0001 and N=0 and lambda=-1
Exact Solution
Forward Euler
Backward Euler
Trapezoidal
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6

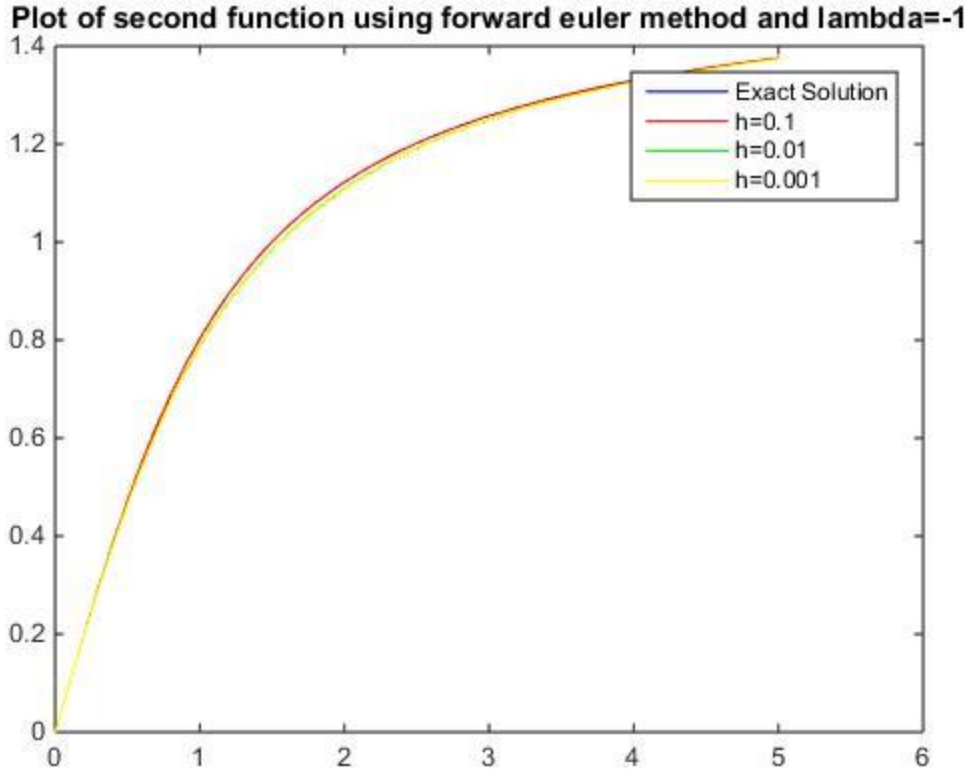

Plot of second function for h=0.0001 and N=0 and lambda=-50
Exact Solution
Forward Euler
Backward Euler
Trapezoidal
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6


Plot of second function for h=0.0001 and N=1 and lambda=-1
Exact Solution
Forward Euler
Backward Euler
Trapezoidal
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6

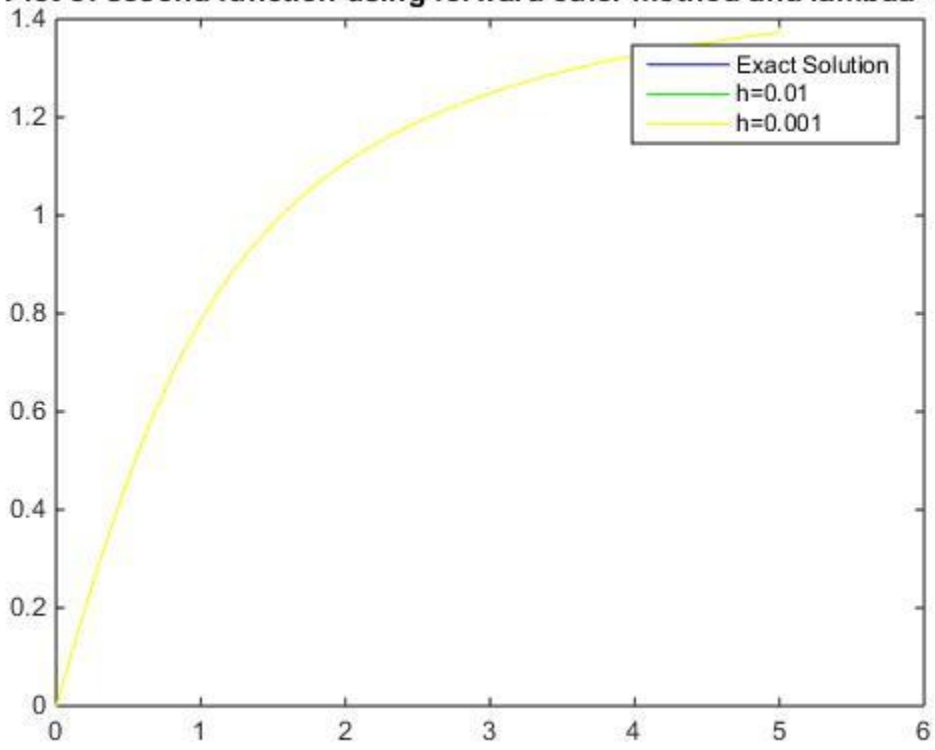

Plot of second function for h=0.0001 and N=1 and lambda=-50
Exact Solution
Forward Euler
Backward Euler
Trapezoidal
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
1
2
3
4
5
6


Plot of second function for h=0.0001 and N=10 and lambda=-1
Exact Solution
Forward Euler
Backward Euler
Trapezoidal
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
1
2
3
4
5
6

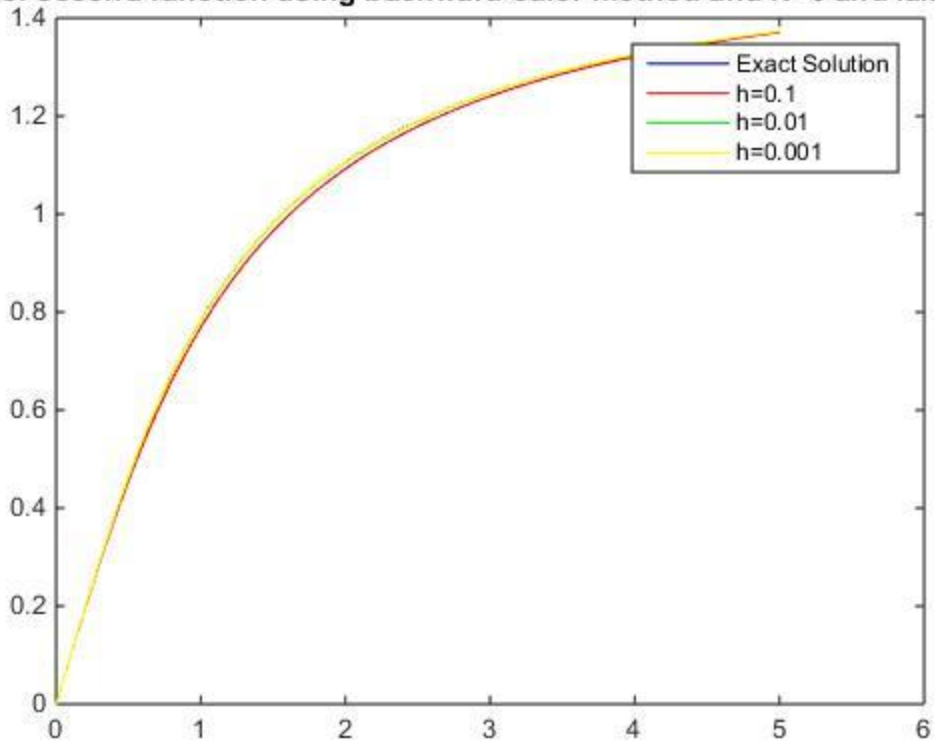

Plot of second function for h=0.0001 and N=10 and lambda=-50
Exact Solution
Forward Euler
Backward Euler
Trapezoidal
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6


Plot of second function using forward euler method and lambda=-1
Exact Solution
h=0.1
h=0.01
h=0.001
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6

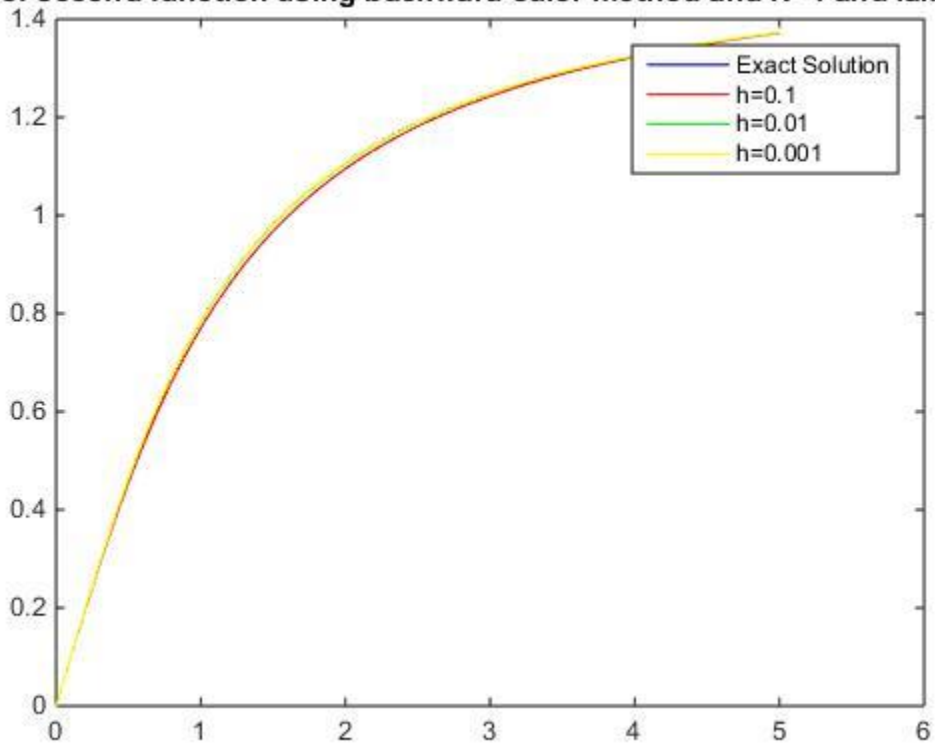
Plot of second function using forward euler method and lambda=-50



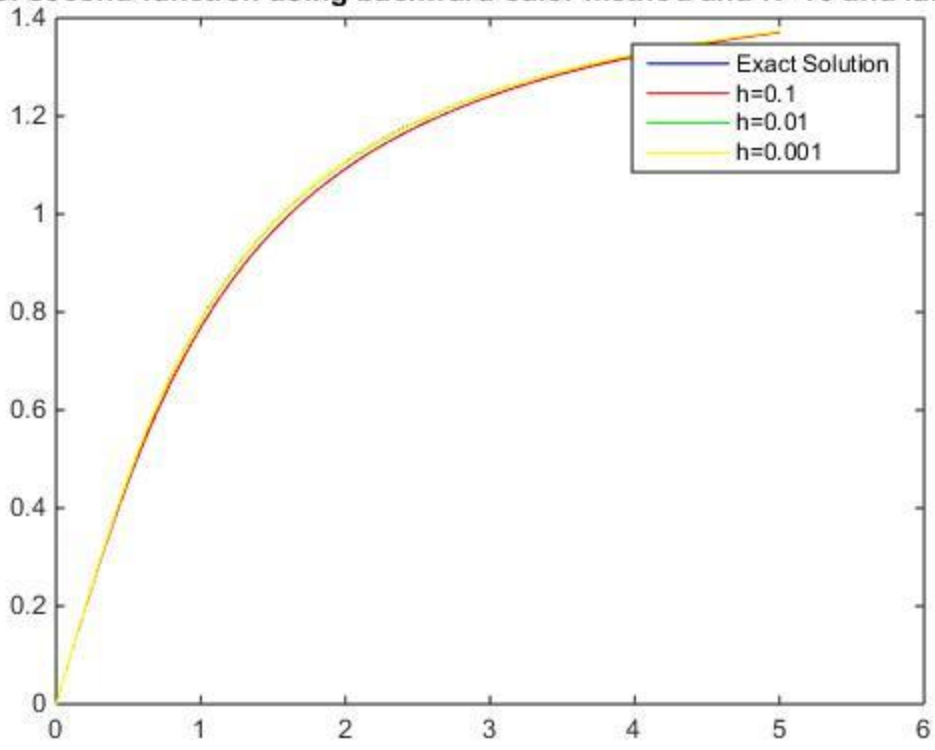
Plot of second function using backward euler method and N=0 and lambda=-



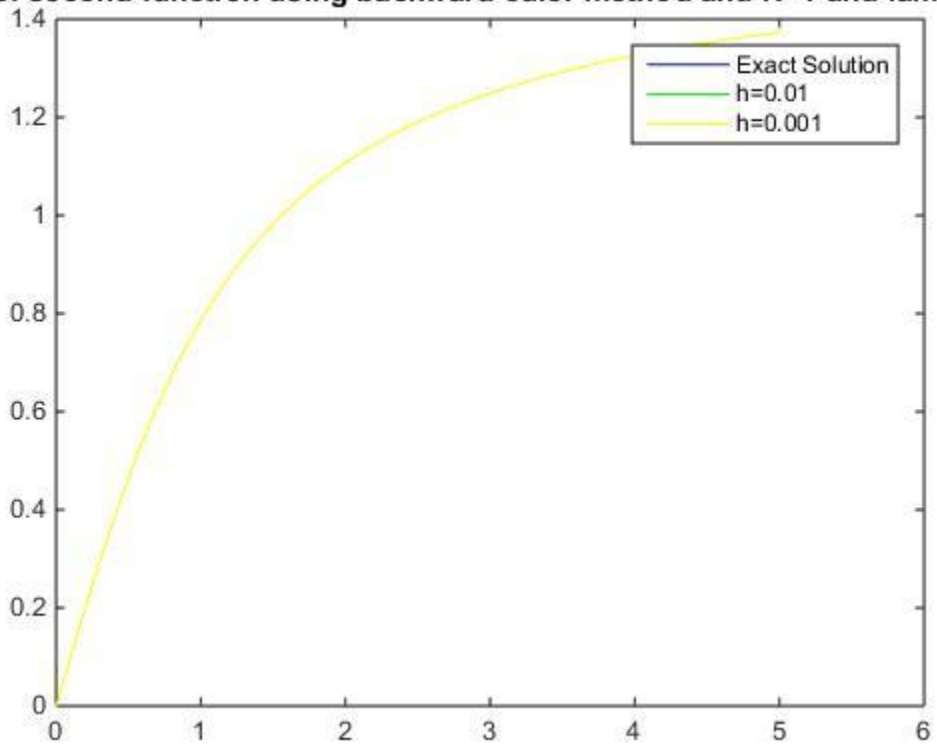
Plot of second function using backward euler method and N=1 and lambda=-



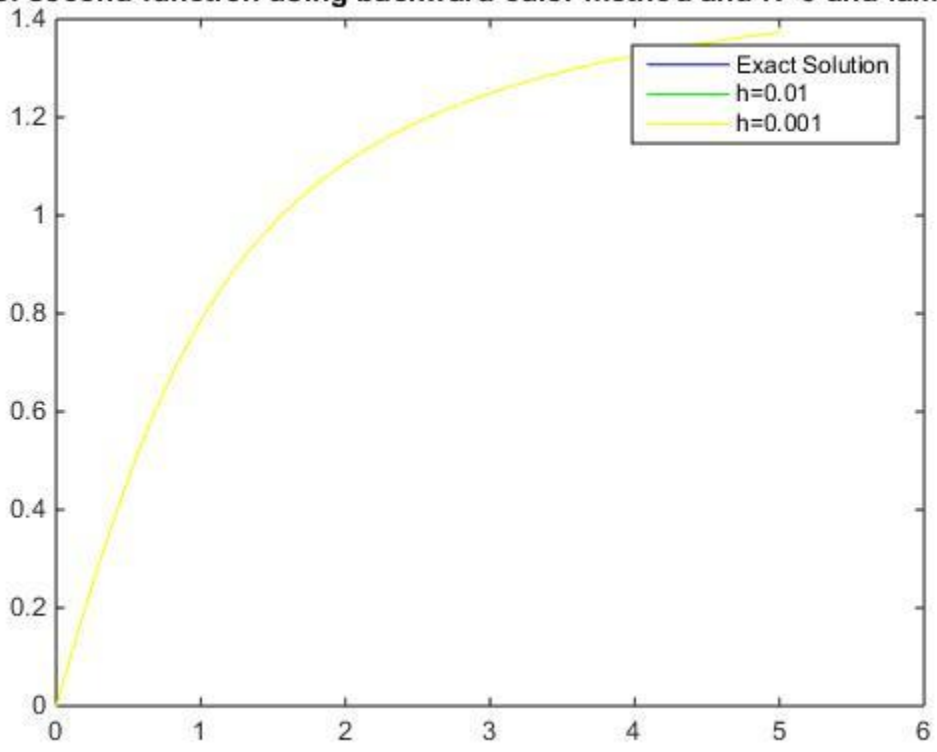
Plot of second function using backward euler method and N=10 and lambda=-



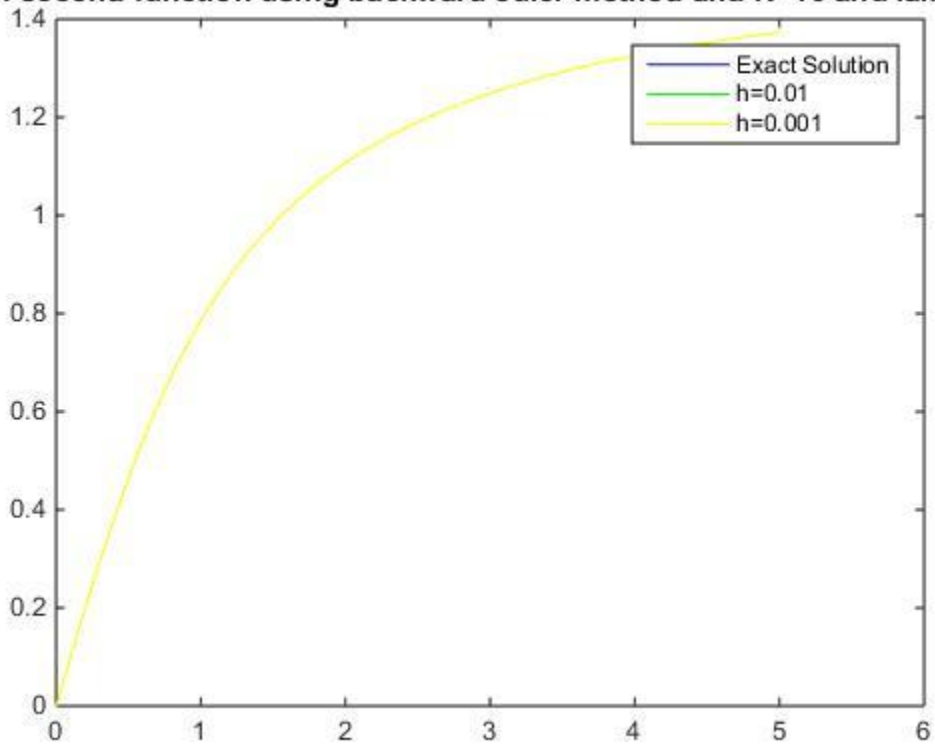
Plot of second function using backward euler method and N=1 and lambda=-5



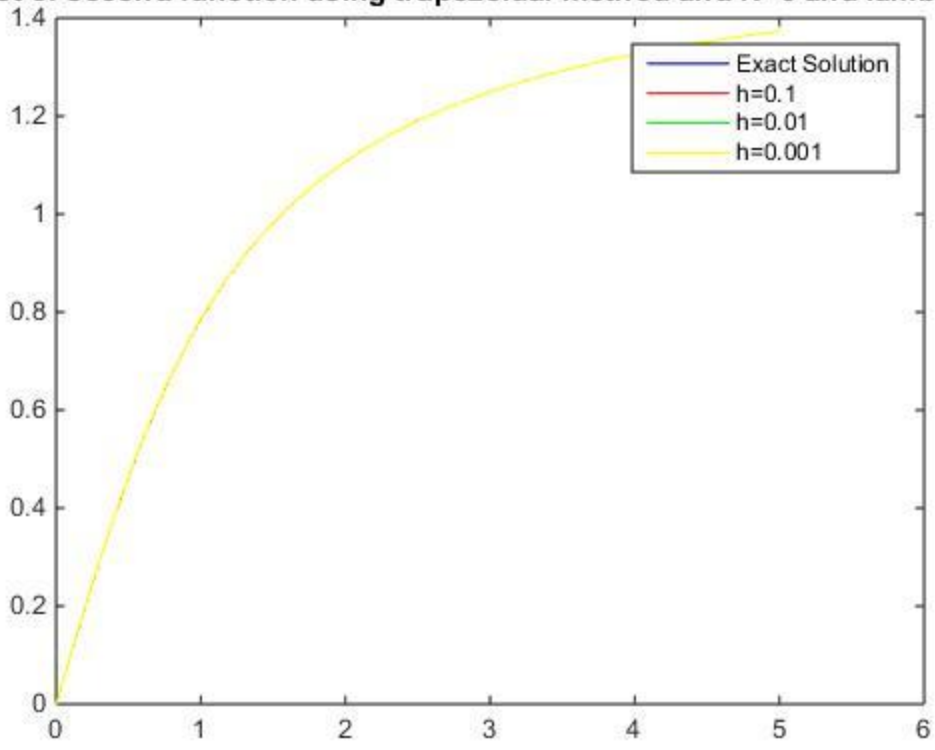
Plot of second function using backward euler method and N=0 and lambda=-5

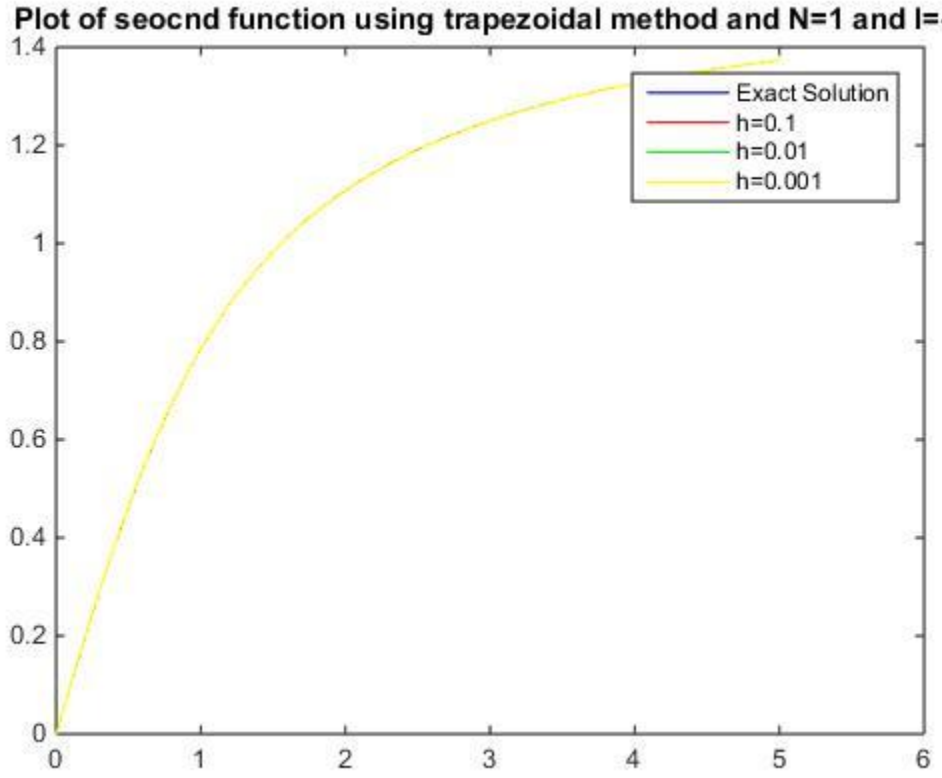


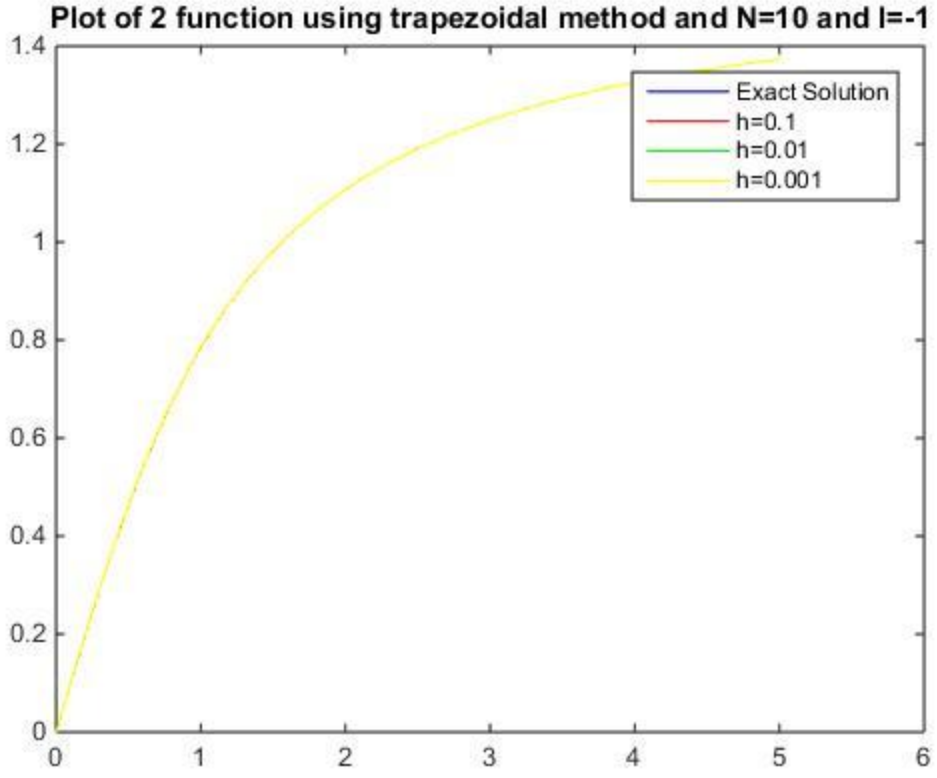
Plot of second function using backward euler method and N=10 and lambda=-



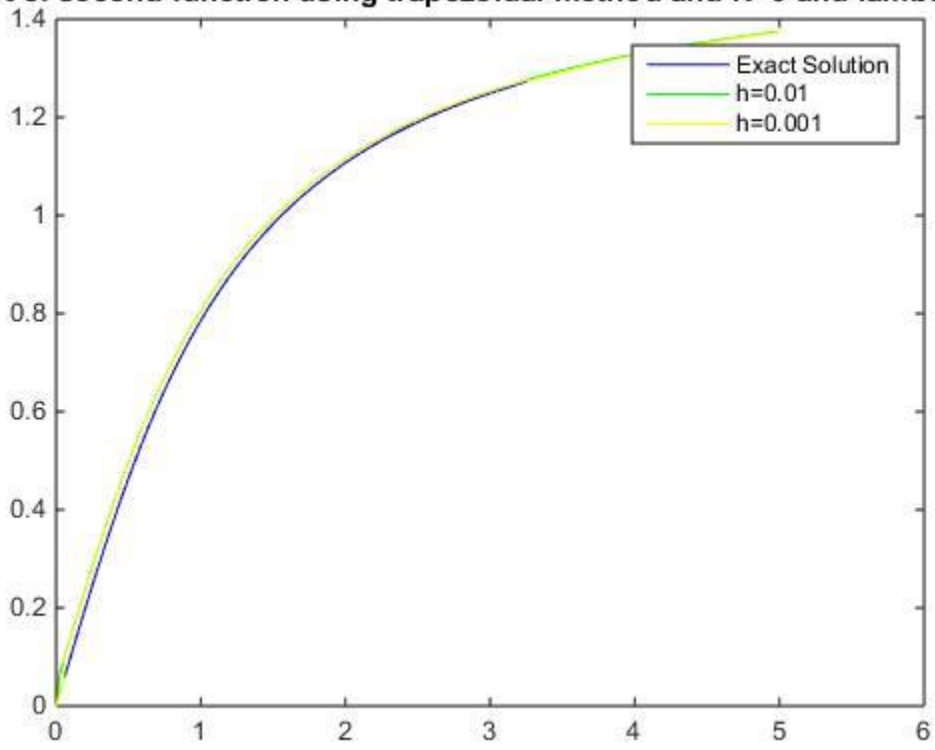
Plot of second function using trapezoidal method and N=0 and lambda=-1



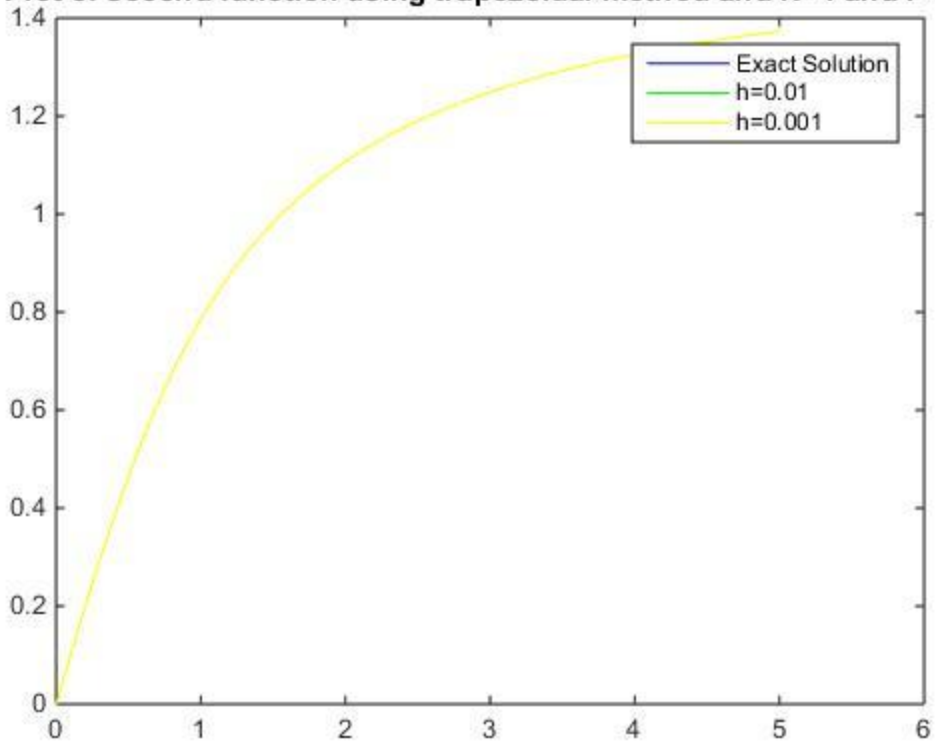

Plot of seocnd function using trapezoidal method and N=1 and l=-1
Exact Solution
h=0.1
h=0.01
h=0.001
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
1
2
3
4
5
6

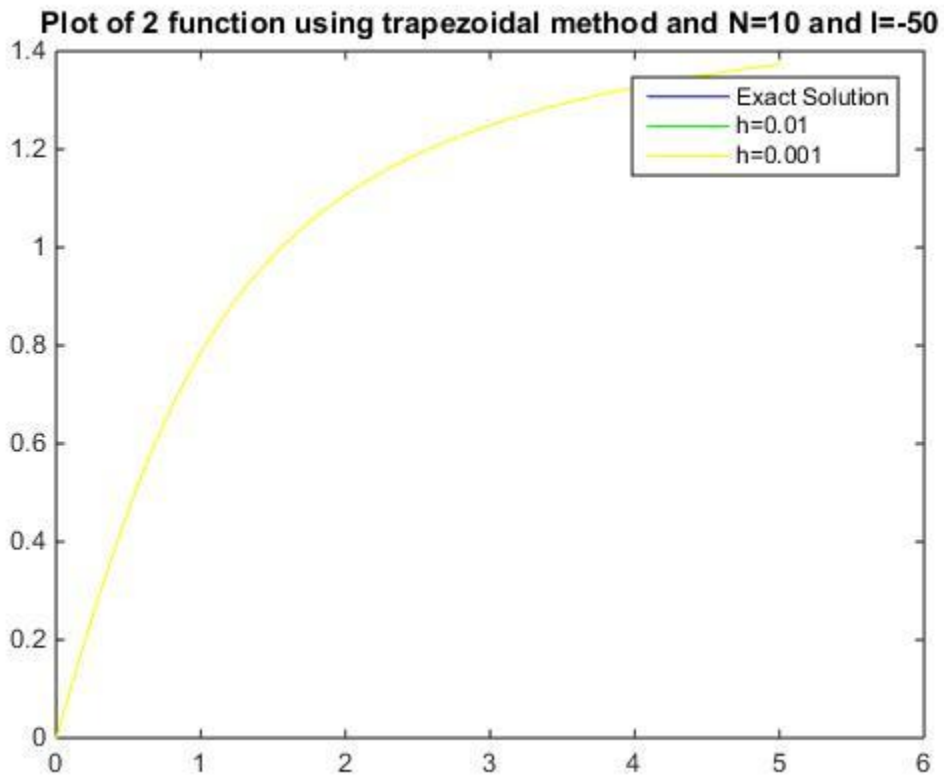

Plot of 2 function using trapezoidal method and N=10 and l=-1
Exact Solution
h=0.1
h=0.01
h=0.001
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
1
2
3
4
5
6

Plot of second function using trapezoidal method and N=0 and lambda=-50



Plot of seocnd function using trapezoidal method and N=1 and l=-50





First Function

	h=0.1	h=0.01	h=0.001
Forward Euler	0.944010319047662	0.203584023041933	0.031805255553985
Backward Euler N=0	50.549601820335539	5.201587682951375	0.028827521350262
Backward Euler N=1	0.218614182962529	0.122846881203642	0.023600459852010
Backward Euler N=10	5.771381665707803	0.701756565198081	0.081759339661211
Trapezoidal N=0	0.871320543215496	0.187884101482170	0.029889191909470
Trapezoidal N=1	0.342695703410930	0.037868817370196	0.003838888114402
Trapezoidal N=10	0.015612610777017	1.782284187363814e-04	3.982294477289372e-06

Second Function and lambda=-1

	h=0.1	h=0.01	h=0.001
Forward Euler	0.002083424921714	2.180130235012179e-04	2.189651096240475e-05
Backward Euler N=0	0.002294925696250	2.202214191704410e-04	2.182202768086228e-05
Backward Euler N=1	0.001391040945861	2.106050392671754e-04	2.182195600664016e-05
Backward Euler N=10	0.002294567880228	2.201249939581818e-04	2.191763072900699e-05
Trapezoidal N=0	2.417542920718496e-05	2.360818724955749e-07	1.432477514384800e-08
Trapezoidal N=1	1.383625685726919e-04	1.433151677998623e-06	1.437909258328318e-08
Trapezoidal N=10	2.417328070780656e-05	2.418426068295787e-07	2.418430788964088e-09

Second Function and lambda=-50

	h=0.1	h=0.01	h=0.001
Forward Euler	3.446656338670198e+25	1.493478589020825e-06	1.496096475595010e-07
Backward Euler N=0	NaN	1.493514813377672e-06	8.380096896409839e-07
Backward Euler N=1	0.001391040945861	2.106050392671754e-04	2.182195600664016e-05
Backward Euler N=10	0.002294567880228	2.201249939581818e-04	2.191763072900699e-05
Trapezoidal N=0	2.417542920718496e-05	2.360818724955749e-07	1.432477514384800e-08
Trapezoidal N=1	1.383625685726919e-04	1.433151677998623e-06	1.437909258328318e-08
Trapezoidal N=10	2.417328070780656e-05	2.418426068295787e-07	2.418430788964088e-09

Discussion

Trapezoidal Method gave the best results irrespective of the function

The accuracy of the result increased as the no. of intervals were increased for all the method