```
>> F=@(t,theta)-0.5*(theta)

F =

  function_handle with value:

    @(t,theta)-0.5*(theta)

>> theta0=100

theta0 =

   100

>> t0=0

t0 =

     0

>> tf=5

tf =

     5

>> (theta)exact=100*exp(-2.5)
 (theta)exact=100*exp(-2.5)
       ↑
Invalid expression. Check for missing multiplication operator, missing or unbalanced↙
delimiters, or other syntax
error. To construct matrices, use brackets instead of parentheses.

Did you mean:
>> exact=100*exp(-2.5)

exact =

    8.2085

>> %(d) RK2 method:
>> h= 0.1

h =

    0.1000

>> Thetah=ode2(F,t0,h,tf,theta0) %Theta at h= delta t

Thetah =
```

```
100.0000
 95.1250
 90.4877
 86.0764
 81.8802
 77.8885
 74.0914
 70.4795
 67.0436
 63.7752
 60.6662
 57.7087
 54.8954
 52.2193
 49.6736
 47.2520
 44.9484
 42.7572
 40.6728
 38.6900
 36.8039
 35.0097
 33.3030
 31.6794
 30.1351
 28.6660
 27.2685
 25.9392
 24.6746
 23.4717
 22.3275
 21.2390
 20.2036
 19.2187
 18.2818
 17.3906
 16.5428
 15.7363
 14.9692
 14.2394
 13.5452
 12.8849
 12.2568
 11.6593
 11.0909
 10.5502
 10.0359
  9.5466
  9.0812
```

```
    8.6385
    8.2174

>> Eh=8.2174-(exact) %the E value at delta t

Eh =

    0.0089

>> Theta2h=ode2(F,t0,2*h,tf,theta0) %Theta at h= 2*(delta t)

Theta2h =

  100.0000
   90.5000
   81.9025
   74.1218
   67.0802
   60.7076
   54.9404
   49.7210
   44.9975
   40.7228
   36.8541
   33.3530
   30.1844
   27.3169
   24.7218
   22.3732
   20.2478
   18.3242
   16.5834
   15.0080
   13.5822
   12.2919
   11.1242
   10.0674
    9.1110
    8.2455

>> E2h=8.2455-(exact) %the E value at 2*(delta t)

E2h =

    0.0370

>> n=ln((Eh)/(E2h))/ln(0.5)
Unrecognized function or variable 'ln'.

>> n=log((Eh)/(E2h))/log(0.5)
```

```
n =

    2.0556

>> truncation error= (h)^n
Unrecognized function or variable 'truncation'.

>> truncation_error = (h)^n

truncation_error =

   0.0088

>> truncation_error = truncation_error_RK2
Unrecognized function or variable 'truncation_error_RK2'.

>> %(e) using RK4
>> h= 0.1

h =

   0.1000

>> Thetah=ode4(F,t0,h,tf,theta0) %Theta at h= delta t

Thetah =

  100.0000
   95.1026
   90.4451
   86.0156
   81.8031
   77.7969
   73.9869
   70.3635
   66.9175
   63.6403
   60.5236
   57.5595
   54.7406
   52.0598
   49.5102
   47.0855
   44.7795
   42.5865
   40.5009
   38.5174
   36.6311
   34.8371
```

```
    33.1310
    31.5084
    29.9653
    28.4978
    27.1022
    25.7749
    24.5126
    23.3121
    22.1704
    21.0847
    20.0521
    19.0700
    18.1361
    17.2479
    16.4032
    15.5999
    14.8359
    14.1093
    13.4183
    12.7612
    12.1362
    11.5419
    10.9766
    10.4391
     9.9278
     9.4416
     8.9792
     8.5395
     8.1213
```

```
>> Eh=mod(8.1213-(exact)) %the E value at delta t
Error using mod
Not enough input arguments.
```

```
>> Eh=abs(8.1213-(exact)) %the E value at delta t

Eh =

    0.0872
```

```
>> Theta2h=ode4(F,t0,2*h,tf,theta0) %Theta at h= 2*(delta t)

Theta2h =

  100.0000
   90.4044
   81.7295
   73.8871
   66.7971
   60.3875
```

```
      54.5930
      49.3544
      44.6186
      40.3371
      36.4665
      32.9673
      29.8039
      26.9440
      24.3586
      22.0212
      19.9082
      17.9978
      16.2708
      14.7096
      13.2981
      12.0220
      10.8685
       9.8256
       8.8827
       8.0304

>> E2h=abs(8.0304-(exact)) %the E value at 2*(delta t)

E2h =

    0.1781

>> n=log((Eh)/(E2h))/log(0.5)

n =

    1.0303

>> truncation_error_RK4 = (h)^n

truncation_error_RK4 =

    0.0933

>> %explicit euler method:
>> Thetah=ode1(F,t0,h,tf,theta0) %Theta at h= delta t

Thetah =

  100.0000
   95.0000
   95.2500
   95.2375
   95.2381
   95.2381
```

```
>> Theta2h=ode1(F,t0,2*h,tf,theta0) %Theta at h= 2*(delta t)

Theta2h =

  100.0000
   90.0000
   91.0000
   90.9000
   90.9100
   90.9090

>> Eh=mod(95.2381-(exact)) %the E value at delta t
Error using mod
Not enough input arguments.

>> Eh=abs(95.2381-(exact)) %the E value at delta t

Eh =

   87.0296

>> E2h=abs(90.9090-(exact)) %the E value at 2*(delta t)

E2h =

   82.7005

>> n=log((Eh)/(E2h))/log(0.5)

n =

   -0.0736

>> truncation_error_Euler = (h)^n

truncation_error_Euler =

    1.1847

>>
```