1)

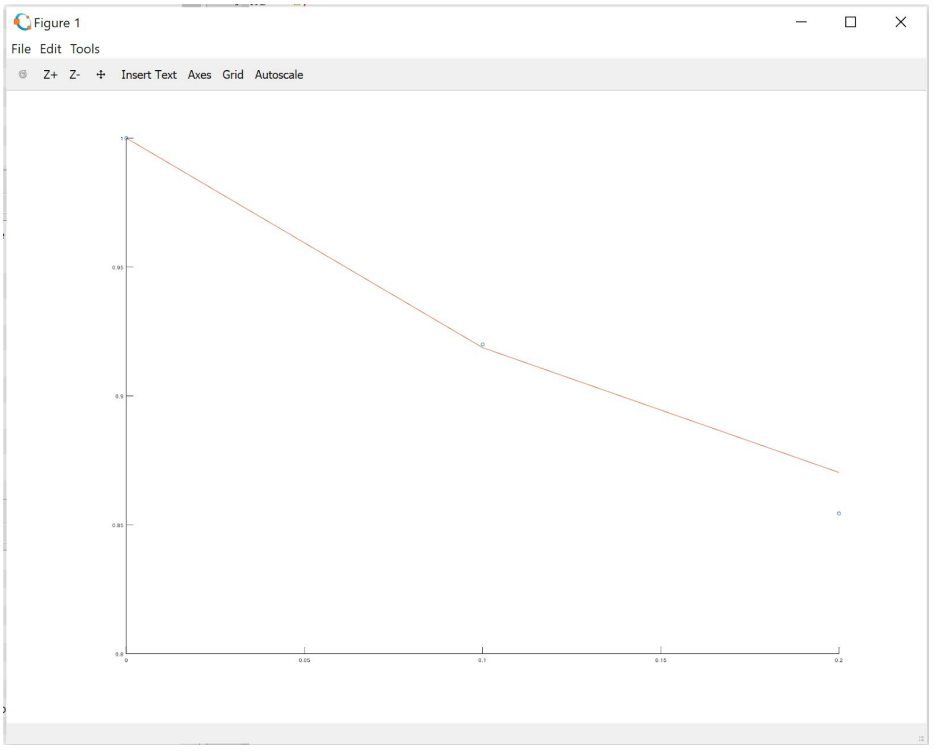
Command Window

```
x0 = 0
y0 = 0
xn =  3
h =  0.10000

 x        y           err
0.100  0.000   0.100
0.200  -0.005   1.000
0.300  -0.015   0.672
0.400  -0.031   0.508
0.500  -0.053   0.410
0.600  -0.080   0.345
0.700  -0.114   0.298
0.800  -0.155   0.263
0.900  -0.203   0.236
1.000  -0.258   0.214
1.100  -0.321   0.196
1.200  -0.392   0.181
1.300  -0.471   0.169
1.400  -0.560   0.158
1.500  -0.658   0.149
1.600  -0.766   0.141
1.700  -0.884   0.134
1.800  -1.013   0.128
1.900  -1.154   0.122
2.000  -1.307   0.117
2.100  -1.472   0.112
2.200  -1.651   0.108
2.300  -1.843   0.104
2.400  -2.050   0.101
2.500  -2.273   0.098
2.600  -2.511   0.095
2.700  -2.767   0.092
2.800  -3.040   0.090
2.900  -3.332   0.088
3.000  -3.644   0.086
```

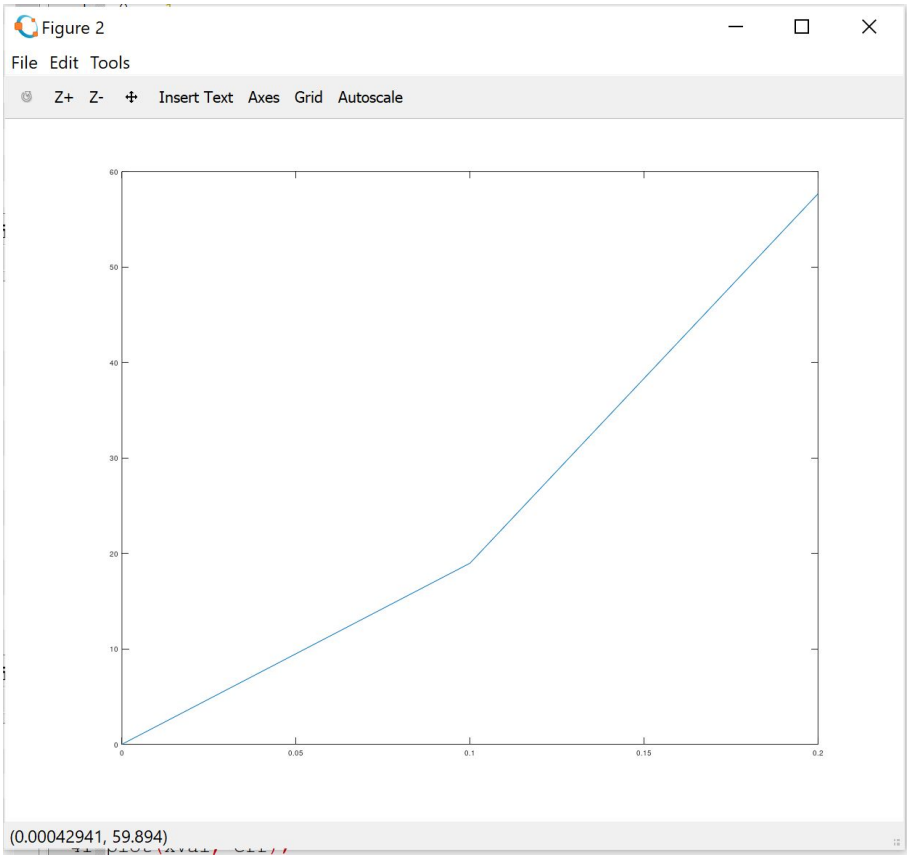
```
ode45 a =

    0.00000
    0.03162
    0.07906
    0.15021
    0.25694
    0.41703
    0.65716
    0.95716
    1.25716
    1.55716
    1.85716
    2.15716
    2.45716
    2.75716
    3.00000

b =

    0.100000
    0.101342
    0.102449
    0.102015
    0.096475
    0.076521
    0.018070
   -0.109025
   -0.305239
   -0.581757
   -0.951575
   -1.429794
   -2.033954
   -2.784439
   -3.515209

>>
```

4 - a)

```
clc;

x0 = 0;
xf = 2;
y0 = 1;
h = 0.1;
n = 2;
a2 = 0.75;
a1 = 1 - a2;

p1 = 1/(2*a2);
q11 = 1/(2*a2);

func = @(x, y)  2*(x - y) + 1;
funcSol = @(x) x + exp(-2*x);


x = zeros(1, n+1);
y = zeros(1, n+1);
x(1) = x0;
y(1) = y0;
err = zeros(1, n+1);
err(1) =  abs((funcSol(x0) - y0) / funcSol(x0)) * 100;

for i = 1 : 1 : n
  k1 = feval(func, x(i), y(i));
  k2 = feval(func, x(i) + p1*h, y(i) + q11*k1*h);
  y(i+1) = y(i) + (a1*k1 + a2*k2)*h;
  err(i+1) = abs((funcSol(i) - y(i+1)) / funcSol(i)) * 100;
end

hold on;
figure(1);
xVal = [x0:h:0.2]
plot(xVal, y, 'o')

figure(1);
plot(xVal, funcSol(xVal))
```



b)



5)

```
Command Window
>> P6_E5

f =

@(x, y) (5 * x ^ 2 - y) / (e ^ (x + y))

x0 =  0
y0 =  1
h =  0.10000
n =  10
x              y        k1         x+h/2         k2         k3
 0.00000    1.00000    -0.36788     0.05000    -0.34542    -0.34543
 0.10000    0.96558    -0.31544     0.15000    -0.27877    -0.27887
 0.20000    0.93780    -0.23648     0.25000    -0.18927    -0.18955
 0.30000    0.91892    -0.13859     0.35000    -0.08478    -0.08531
 0.40000    0.91044    -0.02979     0.45000     0.02660     0.02581
 0.50000    0.91306     0.08201     0.55000     0.13727     0.13626
 0.60000    0.92671     0.18972     0.65000     0.24079     0.23966
 0.70000    0.95068     0.28775     0.75000     0.33245     0.33131
 0.80000    0.98381     0.37232     0.85000     0.40941     0.40836
 0.90000    1.02463     0.44149     0.95000     0.47059     0.46971y =

   1.00000   0.96558   0.93780   0.91892   0.91044   0.91306   0.92671   0.95068   0.98381   1.02463   1.07158

>>
```