
Table of Contents

| | |
|--|---|
| | 1 |
| function calls | 1 |
| Function handles for Analytical function | 1 |
| Plots | 2 |
| Function definitions -- Euler's Method | 2 |

```
h=0.5; % step's size
```

```
%1/2 -- 7 elements  
%1/4 -- 13 elements  
%1/8 -- 25 elements
```

```
x1 = 0:h:3;  
x2 = 0:h/2:3;  
x3 = 0:h/4:3;
```

function calls

```
[x1,y1] = Eulermethod(h,length(x1))  
[x2,y2] = Eulermethod(h/2,length(x2))  
[x3,y3] = Eulermethod(h/4,length(x3))
```

Function handles for Analytical function

```
YAnalyticalF = @(x) 1./((x.^2) + 1);  
yanalytical = YAnalyticalF(x3)
```

```
yanalytical =
```

```
Columns 1 through 7
```

```
1.0000    0.9846    0.9412    0.8767    0.8000    0.7191    0.6400
```

```
Columns 8 through 14
```

```
0.5664    0.5000    0.4414    0.3902    0.3459    0.3077    0.2747
```

```
Columns 15 through 21
```

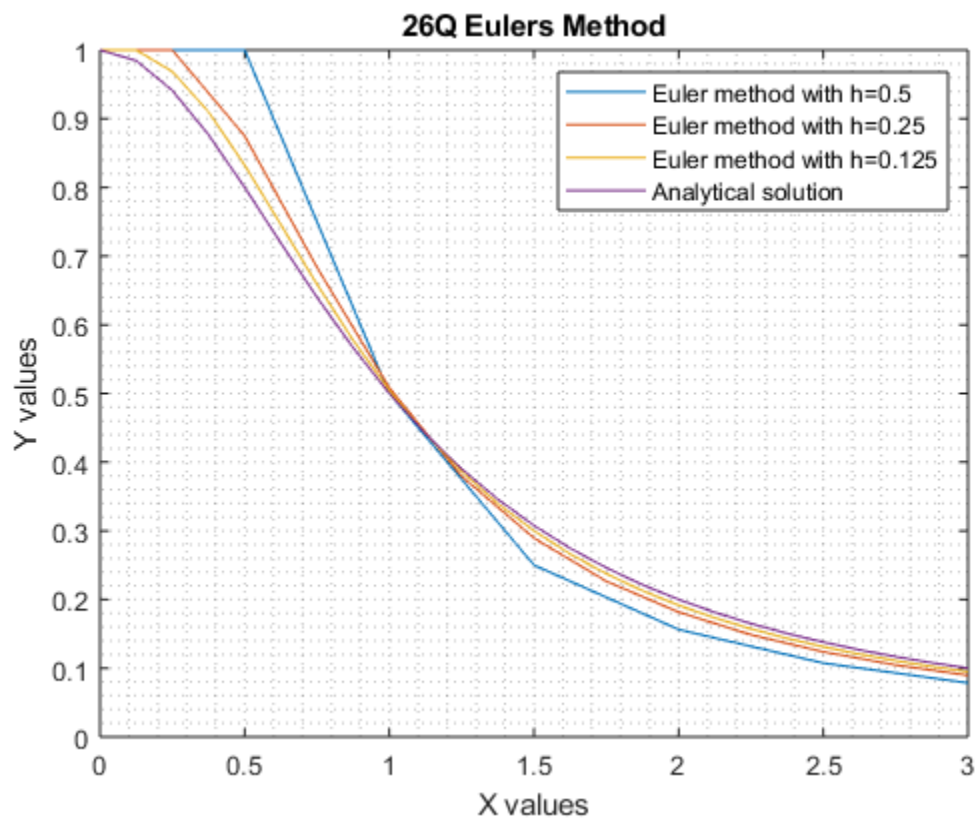
```
0.2462    0.2215    0.2000    0.1813    0.1649    0.1506    0.1379
```

```
Columns 22 through 25
```

```
0.1267    0.1168    0.1079    0.1000
```

Plots

```
plot(x1,y1)
hold on;
grid minor;
plot(x2,y2)
plot(x3,y3)
plot(x3,yanalytical)
legend('Euler method with h=0.5','Euler method with h=0.25','Euler
method with h=0.125','Analytical solution')
xlabel('X values');
ylabel('Y values');
title('26Q Eulers Method');
hold off;
```



Function definitions -- Euler's Method

The given function takes two inputs and output the values of x and y

```
function [x,y] = Eulermethod(h,n)
y(1)=1;
x(1) =0;
for i=1:n-1
y(i+1)= y(i)+ h*(-2*x(i)*((y(i)).^2));
x(i+1)= x(1) + i*h;
```

end
end

x1 =

| | | | | | | |
|---|--------|--------|--------|--------|--------|--------|
| 0 | 0.5000 | 1.0000 | 1.5000 | 2.0000 | 2.5000 | 3.0000 |
|---|--------|--------|--------|--------|--------|--------|

y1 =

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 1.0000 | 1.0000 | 0.5000 | 0.2500 | 0.1563 | 0.1074 | 0.0786 |
|--------|--------|--------|--------|--------|--------|--------|

x2 =

Columns 1 through 7

| | | | | | | |
|---|--------|--------|--------|--------|--------|--------|
| 0 | 0.2500 | 0.5000 | 0.7500 | 1.0000 | 1.2500 | 1.5000 |
|---|--------|--------|--------|--------|--------|--------|

Columns 8 through 13

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| 1.7500 | 2.0000 | 2.2500 | 2.5000 | 2.7500 | 3.0000 |
|--------|--------|--------|--------|--------|--------|

y2 =

Columns 1 through 7

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 1.0000 | 1.0000 | 0.8750 | 0.6836 | 0.5084 | 0.3791 | 0.2893 |
|--------|--------|--------|--------|--------|--------|--------|

Columns 8 through 13

| | | | | | |
|--------|--------|--------|--------|--------|--------|
| 0.2265 | 0.1816 | 0.1486 | 0.1238 | 0.1046 | 0.0896 |
|--------|--------|--------|--------|--------|--------|

x3 =

Columns 1 through 7

| | | | | | | |
|---|--------|--------|--------|--------|--------|--------|
| 0 | 0.1250 | 0.2500 | 0.3750 | 0.5000 | 0.6250 | 0.7500 |
|---|--------|--------|--------|--------|--------|--------|

Columns 8 through 14

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 0.8750 | 1.0000 | 1.1250 | 1.2500 | 1.3750 | 1.5000 | 1.6250 |
|--------|--------|--------|--------|--------|--------|--------|

Columns 15 through 21

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 1.7500 | 1.8750 | 2.0000 | 2.1250 | 2.2500 | 2.3750 | 2.5000 |
|--------|--------|--------|--------|--------|--------|--------|

Columns 22 through 25

| | | | |
|--------|--------|--------|--------|
| 2.6250 | 2.7500 | 2.8750 | 3.0000 |
|--------|--------|--------|--------|

$y^3 =$

Columns 1 through 7

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 1.0000 | 1.0000 | 0.9688 | 0.9101 | 0.8324 | 0.7458 | 0.6589 |
|--------|--------|--------|--------|--------|--------|--------|

Columns 8 through 14

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 0.5775 | 0.5045 | 0.4409 | 0.3862 | 0.3396 | 0.3000 | 0.2662 |
|--------|--------|--------|--------|--------|--------|--------|

Columns 15 through 21

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| 0.2374 | 0.2128 | 0.1915 | 0.1732 | 0.1573 | 0.1434 | 0.1312 |
|--------|--------|--------|--------|--------|--------|--------|

Columns 22 through 25

| | | | |
|--------|--------|--------|--------|
| 0.1204 | 0.1109 | 0.1024 | 0.0949 |
|--------|--------|--------|--------|

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