Euler Method

$$y_{n+1} = y_n + h \cdot f(x_n, y_n)$$

```
clear all;
format long;

% params
f = @(x, y) cos(x) + sin(x);
y(1) = 1;
xn = 0.8;
x0 = 0;
h = 0.2;

% function
x = x0:h:xn;

for n = 1:length(x)-1
    y(n+1) = y(n) + h * f(x(n), y(n));
    fprintf('Approximate value of y(%f) = %f\n', x(n+1), y(n+1))
end
```

```
Approximate value of y(0.200000) = 1.200000
Approximate value of y(0.400000) = 1.435747
Approximate value of y(0.600000) = 1.697843
Approximate value of y(0.800000) = 1.975839
```

```
x
```

```
x = 1×5
                   0   0.200000000000000   0.400000000000000   0.600000000000000 ···
```

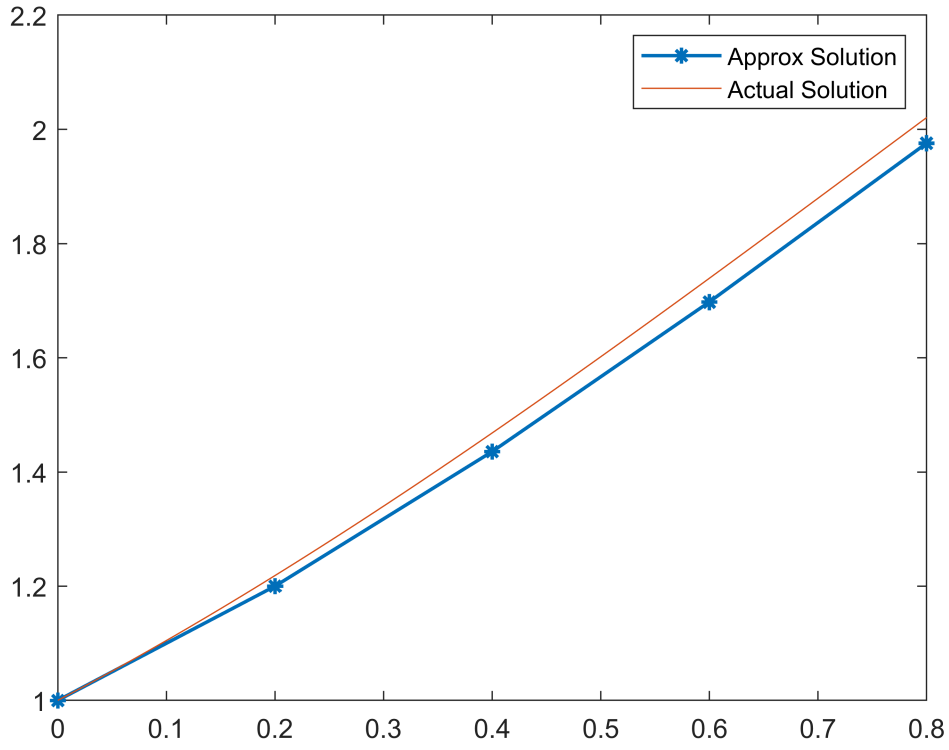
```
y
```

```
y = 1×5
   1.000000000000000   1.200000000000000   1.435747181727260   1.697843048989568 ···
```

```
plot(x, y, '*-', 'LineWidth', 1.3);
hold on;
soln = dsolve('Dy = cos(x) + sin(x)', 'y(0)=1', 'x')
```

```
soln = sin(x) − cos(x) + 2
```

```
xt = x0:0.01:xn;
yt = subs(soln, xt);
plot(xt, yt, 'LineWidth', 1.3);
hold off;
legend('Approx Solution', 'Actual Solution')
```


Approx Solution
Actual Solution
2.2
2
1.8
1.6
1.4
1.2
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8