

# Assignment 06

## Ordinary Differential Equations

### Euler Method

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March 28, 2021

## 1 Given Problem

$$y' = -100y + 100t + 101$$
$$y(0) = 1$$

## 2 Solution

t	Analytical	y(0) = 1	y(0) = 0.99	y(0) = 1.01
0	1	1	0.99	1.01
0.1	1.1	1.1	1.19	1.01
0.2	1.2	1.2	0.39	2.01
0.3	1.3	1.3	8.59	-5.99
0.4	1.4	1.4	-64.21	67.01
0.5	1.5	1.5	591.99	-588.99
0.6	1.6	1.6	-5312.81	5316.01
0.7	1.7	1.7	47831.4	-47828
0.8	1.8	1.8	-430465	430469
0.9	1.9	1.9	3.87421e+06	-3.8742e+06
1	2	2	-3.48678e+07	3.48678e+07

## 3 Conclusion \ Observation

- The analytical solution of the problem is of the form

$$y = t + 1 + \frac{C_1}{e^{100t}}$$

where the  $C_1$  is constant and depend on the initial condition. for  $y = 1$  at  $t = 0 \implies C_1 = 0$ . So the exponential term vanishes.

- For other initial conditions the exponential term remains and  $h = 0.1$  is large step size to approximate  $y$  with exponential term which results in high error.