

Applied Mathematics 244 - Assignment 1

• using PlutoUI , CairoMakie , DifferentialEquations , ParameterizedFunctions

Problem 2

```
• begin
•     f(t, y) = e^(-2t) * y
•     a = 0
•     b = 2
•     h = 1//2
•     n = (b - a) ÷ h
•     y_s = zeros(n+1)
•     y = zeros(n+1)
•     y2 = zeros(n+1)
•     t = zeros(n+1)
•     t2 = zeros(n+1)
• end;
```

```
• y_e(t) = 2e^(1//2*(1-e^(-2*t)));
```

```
• for i in 1:n
•     y[1] = 2
•     t[i+1] = t[i] + h
•     y_s[i+1] = y[i] + h * f(t[i], y[i])
•     y[i+1] = y[i] + h/2 * (f(t[i], y[i]) + f(t[i+1], y_s[i+1]))
• end
```

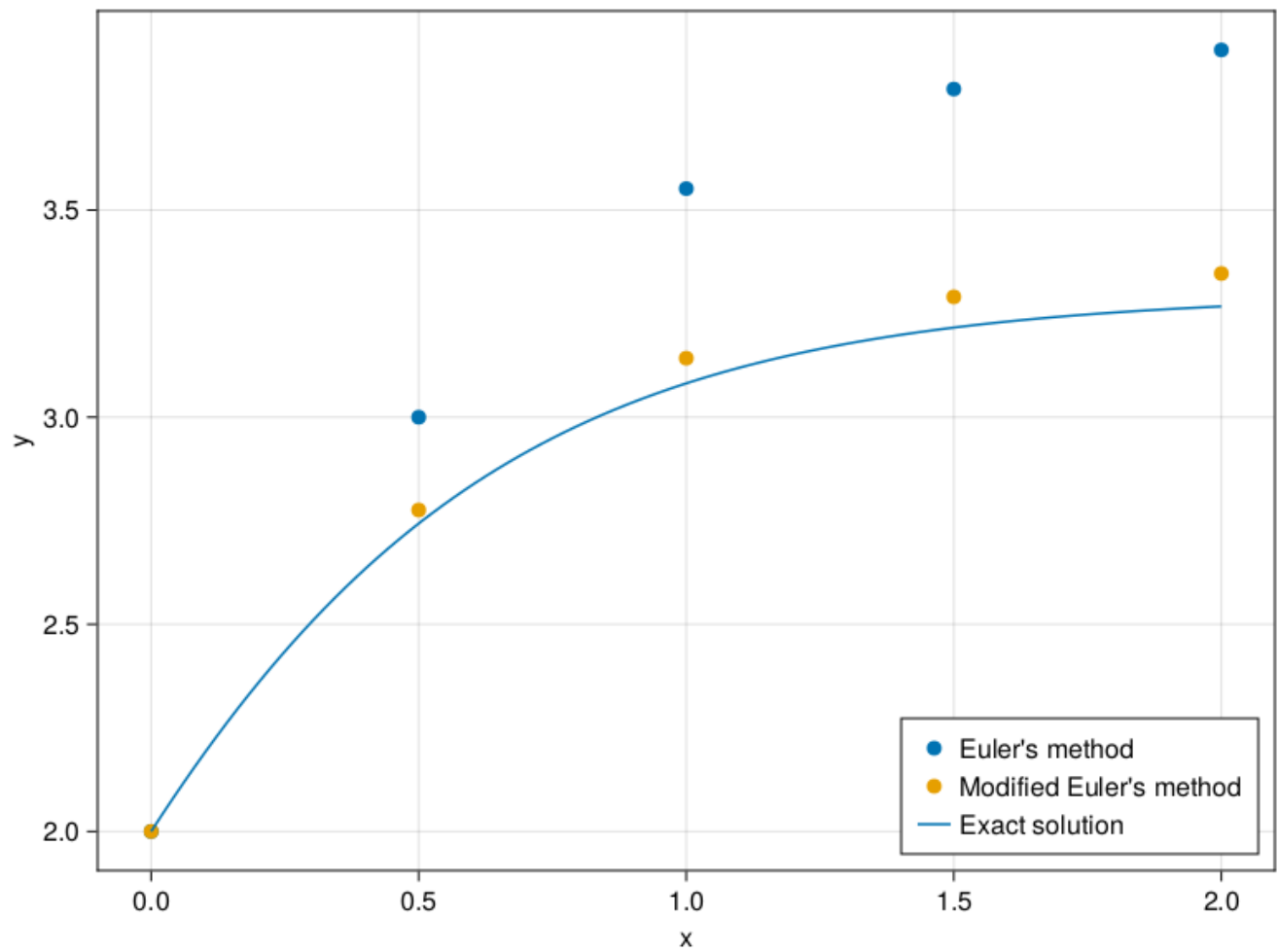
```
• for i in 1:n
•     y2[1] = 2
•     t2[i+1] = t2[i] + h
•     y2[i+1] = y2[i] + h * f(t2[i], y2[i])
• end
```

```
[2.0, 3.0, 3.55182, 3.79216, 3.88656]
```

```
• y2 # eulers
```

```
[2.0, 2.77591, 3.1424, 3.29048, 3.34688]
```

```
• y # modified
```



```

• begin
•   fig1 = Figure()
•   ax1 = Axis(fig1[1, 1],
•       xlabel = "x",
•       ylabel = "y")
•   s1 = scatter!(t,y2)
•   s2 = scatter!(t,y)
•   l = lines!(range(0, b, length=100),y_e)
•   axislegend(ax1,
•       [s1, s2, l],
•       ["Euler's method", "Modified Euler's method", "Exact solution"], position = :rb)
•   fig1
• end

```

```

• #save("euler.pdf", fig1)

```

