Exercises on numerical schemes for differential equations

1 Comparison of numerical schemes

We consider two differential equations :

$$x'(t) = x(t)$$

and

$$x'(t) = x(t) + t - 1$$

with the initial condition $x(0) = 1$.

1. For each of these equations, compute the numerical solution at time $t = 0.2$ using the time step $\Delta t = 0.1$, with the Euler method, the Heun method, and the second order Runge-Kutta method.

2. Compare the obtained values with the exact solution : which method seems the more accurate, the less accurate ? What do you notice otherwise ?