4.2

(nonlinear Fisher PDE)

$$\begin{cases} u_t = d \cdot u_{xx} + \gamma u(1-u) \\ u(x,0) = e^{-50(x-\frac{1}{2})^2}, & x \in [0,1] \\ u(0,t) = u(1,t) = 0, & t \in [0,T] \end{cases}$$

Apply the first step in the Method-of-Lines:

$$\begin{cases} \dot{\vec{u}}(t) = d\, D_2 \vec{u}(t) + \vec{f}(\vec{u}) \\ \vec{u}(0) = \vec{u}_0 \end{cases}$$

In the second step: **IMEX-method**

$$\Rightarrow \frac{\vec{u}^{n+1} - \vec{u}^n}{\Delta t} = d\, D_2 \vec{u}^{n+1} + \vec{f}(\vec{u}^n).$$

Choose $\Delta x = 10^{-2}$, $T = 1$, $d = 10^{-3}$, $\gamma = 5$.

Time stepsize $\Delta t = ?$