

## Task for lecture 13

Consider the elliptic partial differential equation

$$-\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right) = 1 + x + y \quad \text{for} \quad (x, y) \in \Omega \quad (1)$$

where  $\Omega = \{(x, y) | 0 < x < 1, 0 < y < 1\}$  and  $u(x, y) = 0$  for  $(x, y) \in \partial\Omega$

- Determine:  $\lambda, f(x, y), a_0(x), a_1(x), b_0(y), b_1(y)$
- Set up the system of linear equations for  $N = 4, 8, 16 \dots$
- Perform Richardson extrapolation and error estimation for  $u(0.5, 0.5)$