problem solved by exact.py
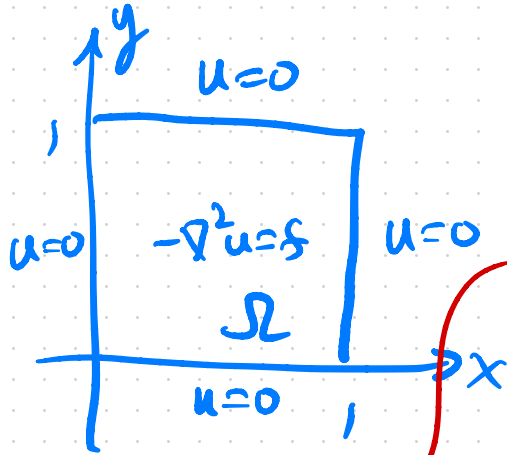
choose

$$U(x,y) = x(1-x)\sin(\pi y)$$

(observe $\left. u \right|_{\partial \Omega} = 0$ by construction)

compute

$$f(x,y) = -\nabla^2 u$$
$$= -u_{xx} - u_{yy}$$
$$= -(-2)\sin(\pi y) - \left(x(1-x)(-\pi^2)\sin(\pi y)\right)$$
$$= \left(2 + \pi^2 x(1-x)\right)\sin(\pi y)$$

this cheat
is called
"method of manufactured
solutions" = MMS

In the figure: y axis, x axis, domain Ω with $-\nabla^2 u = f$, and boundary conditions $u=0$ on all sides.