

### Homework 3

Solve the Laplace equation

$$\nabla^2 u = 0$$

inside a cylinder of radius 4 and height 5. In cylindrical coordinates the cylinder is described as follows:

$$0 \leq \rho \leq 4, \quad -\pi \leq \phi \leq \pi, \quad 0 \leq z \leq 5.$$

The boundary conditions are

$$\begin{aligned} u(4, \phi, z) &= 0, \\ \frac{\partial u}{\partial z}(\rho, \phi, 0) &= 0, \\ u(\rho, \phi, 5) &= f(\rho) \cos(3\phi), \end{aligned}$$

**To be handed in before 5 p.m., February 26.**