## Exercise 45

Solve the axisymmetric biharmonic equation for the free vibration of an elastic disk

$$b^2\left(\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}\right)^2 u + u_{tt} = 0, \quad 0 < r < \infty,\ t > 0,$$
$$u(r,0) = f(r), \quad u_t(r,0) = 0 \quad \text{for } 0 < r < \infty,$$

where $b^2 = \frac{D}{2\sigma h}$ is the ratio of the flexural rigidity of the disk and its mass $2h\sigma$ per unit area.