

**Exercise 47**

Solve the nonhomogeneous diffusion problem

$$\begin{aligned}u_t &= \kappa \left( u_{rr} + \frac{1}{r} u_r \right) + Q(r, t), \quad 0 < r < \infty, t > 0, \\u(r, 0) &= f(r), \quad 0 < r < \infty,\end{aligned}$$

where  $\kappa$  is a constant.