

Exercise 1.5.25

Suppose a sphere of radius 2 satisfies $\frac{\partial u}{\partial t} = \nabla^2 u + 5$ with $u(x, y, z, 0) = f(x, y, z)$ and on the surface of the sphere it is given that $\nabla u \cdot \hat{n} = 6$, where \hat{n} is a unit outward normal vector. Calculate the total thermal energy for this sphere as a function of time. (*Hint*: Use the divergence theorem.)