

HW 4: Due Thursday Feb. 25

1. Consider a two dimensional domain $\Omega = \{\mathbf{x} \mid \|\mathbf{x}\| < R\}$, where $R = 1$ m. Let the domain be composed of a Portland cement with thermal conductivity $k = 0.29$ W/mK. Assume a temperature field $T(x, y) = T_o + T_d\sqrt{x^2 + y^2}/R$, where $T_o = 20$ C and $T_d = 100$ C.
 - (a) Find and plot the heat flux field over the domain.
 - (b) What is the total energy per unit time moving through the boundary of the domain? Is it moving in or out of the domain?
 - (c) Is this field a steady state temperature distribution for a system with $f(x, y) = 0$, where $f(x, y)$ is the volumetric heat supply? If not, what must $f(x, y)$ equal for steady state? Specify and plot if not zero.
2. JNR 8.4(a)
3. JNR 8.7(b)
4. JNR 8.21 [Note: this is just like the heat equation with $k = 1$]