Supplementary problems: 13.5 # 1-4,9; 13.6 # 1,2,7
Quiz: 13.5 and 13.6

Compulsory problems:

(1) Consider the 2-D heat conduction problem

$$\frac{\partial u}{\partial t} = K\left[\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right]; \qquad u(0,y) = u(\pi,y) = 0; \qquad u(x,0) = 1, \quad u(x,1) = 2; \qquad u(x,y,t=0) = f(x,y). \tag{1}$$

(a) **[40 pts.]** Solve for the steady-state (also known as the equilibrium) solution; i.e. Laplace's equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0; \qquad u(0,y) = u(\pi,y) = 0; \qquad u(x,0) = 1, \quad u(x,1) = 2; \tag{2}$$

(b) **[10 pts.]** Notice that this solution can be used in a change of variables to solve the corresponding homogeneous heat equation. Don't do any work, but rather intuitively write down the corresponding homogeneous 2-D heat equation. **Do not solve**.

(2) **[10 pts.]** Convert the following nonhomogeneous heat problem to it's corresponding homogeneous problem. **Do not solve!**.

$$\frac{\partial u}{\partial t} = K\left(\frac{\partial^2 u}{\partial x^2} + 1\right); \qquad u(0,t) = 1, \quad u(1,t) = 2; \qquad u(x,0) = f(x) \tag{3}$$

Your homework raw score is: $\frac{n}{2m} \cdot M + \left(1 - \frac{n}{2m}\right) \cdot N = N + \frac{n}{2m}(M - N)$. For this homework, $M = 60$, $m = 8$, N is the number of compulsory problems you get correct, and n is the number of supplementary problems you complete. It should be noted that for the supplementary problems I will be looking for **full completion**, but I won't take off points for mistakes.