MA483 Instructor: Russell Brown
Spring 2001

Homework #2.
Due Wednesday, 31 January 2001.
Strauss section 1.3, #2, 4, 9 and section 1.4, #1, 3, 5.
In §1.3 #4, we are looking for a function u which is depends on z and t. We have two contributions to the flux, the simple transport due to gravity and Fickian diffusion.
In §1.3 #9, the integrals are quite simple to evaluate. In each case, we are integrating a constant, so the integral of a constant k over a set is the size of the set S multiplied by the constant.
In §1.4 #1, search for solutions of the form $f(t) + x^2$.
I am not sure if we really know enough to completely justify the answer to #3. However, you can write down an expression for the temperature and explain why it is plausible. Show that energy is conserved.
In §1.4 #5, the equilibrium solution has to solve $u_t = ku_x x$ and also $u_t = 0$, since the system is not changing over time. Thus, we have $u_x x = 0$ in each part of the rod where the conductivity is constant.

Comments on Homework #1. Problem #1, section 1.2. The best students wrote that $2u_t + 3u_x$ is a directional derivative in the (t, x) plane in the direction $(2, 3)$. Thus, if u solves this pde, then u is constant along lines parallel to $(2, 3)$.
I prefer this solution to a solution which appeals to equation (2) in the text. The reason for this is that there is more to mathematics than "plug-and-chug". However, I cannot justify deducting points for a correct solution. The moral here is: A perfect score is different from a perfect paper.
Additional problem 1. Many students had trouble finding the second derivatives of u. Since almost everyone found the first derivative correctly, the problem is not that you do not know the chain rule, but that we need a bit more practice so that we can consistently apply it correctly. The moral here is: Math is like soccer, we need lots of touches on the ball to develop basic skills.

January 22, 2001