

1. p. 27, Ex.4, **Strauss**.
2. p. 28, Ex. 5, **Strauss**.
3. p. 28, Ex 6, **Strauss**.
4. In this problem, the PDE's all have the same characteristics, $x = x_0 + ct$. Let $v(t) = u(x_0 + ct, t)$ be the restriction of u to a characteristic line. Find the ODE satisfied by v in each case. Solve it, and then restate the answer in terms of u .

(a)

$$u_t + cu_x + u = 0, \quad u(x, 0) = f(x).$$

(b)

$$u_t + cu_x = xt, \quad u(x, 0) = f(x).$$

(c)

$$u_t + cu_x = u^2, \quad u(x, 0) = f(x).$$

The ODE satisfied by v is nonlinear. The width of the strip containing the x axis on which u exists depends on $f(x)$.

5. p. 38, Ex 9, **Strauss**. The best way to do this problem is to look for solutions of the form $u(x, t) = f(x - ct)$. Sketch some of the characteristic lines. If $(x, t) = (2, 1)$, find the domain of dependence of (x, t) .