Homework Set 1. Due Feb 9, 2004

1. Solve $u_t + (\cosh x)^{-1} u_x = 0$; $u(0, x) = \sinh x$ for $t < 0$ and $t > 0$.

2. If $b(x)$ is a smooth function and $F(s, t, x)$ is the solution of

$$\frac{dF(t, x)}{dt} = b(F(t, x)); F(s, x) = x$$

then show that the solution of

$$\frac{\partial u(t, x)}{\partial t} + b(x)\frac{\partial u(t, x)}{\partial x} = g(t, x); u(T, x) = f(x)$$

is given by

$$u(t, x) = -\int_t^T g(\tau, F(t, \tau, x))d\tau + f(F(t, T, x))$$