18.152 - Introduction to PDEs, Fall 2004 Profs. Gigliola Staffilani and Andras Vasy

Partial solutions to problem set 1

Problems from Strauss, Walter A. *Partial Differential Equations: An Introduction.* New York, NY: Wiley, March 3, 1992. ISBN: 9780471548683.

Problem 9.3

$$(1+x^2)u_x + u_y = 0.$$

The characteristic lines are given by

$$\frac{dy}{dx} = \frac{1}{1+x^2},$$

and hence they are

$$y = \arctan x + C.$$

Thus the solution is an arbitrary function of $C = y - \arctan x$:

$$u(xy) = f(y - \arctan x), f \text{ arbitrary.}$$