

Math 3326  
Spring Semester 2009  
Problem Set #3

1. In each of the following problems, determine the characteristic equation, the transformed equation, and the general solution of the partial differential equation. Then attempt to find particular solutions satisfying the Cauchy data on the given curves:

(a)  $3yu_x - 2xu_y = 0$

(i)  $u(x, y) = x^2$  on the line  $y = x$

(ii)  $u(x, y) = 1 - x^2$  on the line  $y = -x$

(iii)  $u(x, y) = 2x$  on the ellipse  $3y^2 + 2x^2 = 4$

(b)  $4u_x + 8u_y - u = 1$

(i)  $u(x, y) = \cos x$  on the line  $y = 3x$

(ii)  $u(x, y) = x$  on the line  $y = 2x$

(iii)  $u(x, y) = 1 - x$  on the curve  $y = x^2$

(c)  $yu_x + x^2u_y = xy$

(i)  $u(x, y) = 4x$  on the line  $y = \frac{1}{3}x^{3/2}$

(ii)  $u(x, y) = x^3$  on the curve  $3y^2 = 2x^3$

(iii)  $u(x, y) = \sin(x)$  on the line  $y = 0$ .