

PDEs: UNASSESSED HOMEWORK I

Please hand (the solutions of) it in at the end of our lecture on Tuesday 5/3/2013

For each of the following partial differential equations, solve the characteristic equation and then find the general solution of the partial differential equation. Hence, where possible, find the solutions satisfying the initial data on the given curves.

a) $u_x + u_y + 2u = 0$;

Find a solution satisfying $u(x, y) = e^{-2x}(1 - x^2)$ on the curve $y = x - x^2$;

b) $3yu_x - 2xu_y = 0$;

Find a solution satisfying $u(x, y) = 2x$ on the ellipse $3y^2 + 2x^2 = 4$.

c) $yu_x + x^2u_y - xy = 0$;

i) Find a solution satisfying $u(x, y) = 4x$ on the curve $y = \frac{1}{3}x^{3/2}$;

ii) Find a solution satisfying $u(x, y) = x^3$ on the curve $3y^2 = 2x^3$;