SON TESLİM TARİHİ: Çarşamba 17 Şubat 2016 saat 12:00'e kadar.

Egzersiz 1 (Order). [5 × 4p] Give the order of each of the following PDEs. The first one is done for you.

(ω) $u_{xyz} + u_{xy}u_z - 7u - \sin z = 0$ (3rd order)

(a) $u_{xx} + u_{yyy} = 0$

(b) $u_{xx} + u_{xy} + a(x)u_{yy} + \log u = f(x,y)$

(c) $u_{xxx} + u_{xyyyx} + a(x)u_{xxy} + u^2 = f(x,y)$

(d) $uu_{xx} + u_{yy}^2 + e^u = 0$

(e) $u_x + cu_{yy} = d$

Egzersiz 2 (Linearity and Homogeneity).

[10 × 3p] For each PDE, state if it is

(L) Linear;

(QL) Quasilinear and nonlinear; or

(NL) Nonlinear, but not quasilinear;

[10 × 3p] and state if it is

(H) Homogeneous; or

(NH) Nonhomogeneou.

The first one is done for you.

(ω) $u_{xyz} + u_{xy}u_z - 7u - \sin z = 0$ (QL, NH)

(a) $u_{xx} + u_{yy} - 2u = x^2$

(b) $u_{xy} = u + x$

(c) $u_x + xu_y = \frac{1}{u}$

(d) $u_x^2 + \log u = 2xy$

(e) $u_{xx} - 2u_{xy} + u_{yy} = \cos x$

(f) $u_x(1 + u_y) = u_{xx}$

(g) $(\sin u_x)u_x + u_y = e^x$

(h) $2uu_{xx} - 4u_{xy} + 2u_{yy} + 3u = 0$

(i) $u_x + u_x u_y - u_{xy} = 0$

(j) $u_{xx} + u_{yy} = 0$

Egzersiz 3. [20p] Show that
$$u = F(xy) + xG\left(\tfrac{y}{x}\right)$$
is a solution of
$$x^2 u_{xx} - y^2 u_{yy} = 0$$
for any twice differentiable functions F and G.