

**Question**

Classify (give order etc.) each of the following partial differential equations

(a)  $u_{xx} + u_{yy} = 7u_x$

(b)  $u_{xx} + x^2u_x = y^2u_y$

(c)  $uu_x + u_y = xu$

(d)  $u_x + u_y = x$

(e)  $e^xu_x + e^yu_y = u^2$

(f)  $\nabla^2(\nabla^2u) = u_{xx}$

(g)  $(x^3u_{xx})_x = (y^{-2}u_y)_y$

**Answer**

(a) Second order, linear, homogeneous, constant coefficients

(b) Second order, linear, homogeneous, constant coefficients

(c) First order, quasi-linear

(d) First order, linear

(e) First order, quasi-linear

(f) Fourth order, linear, homogeneous, constant coefficients

(g) Third order, linear, homogeneous, constant coefficients