Problem:

Determine the type of the equation at the point (1; 1).

$xu_{xx} + 2xyu_{xy} + yu_{yy} = \cos u^2$.

Solution:

The characteristic equation is $x(dy)^2 - 2xydxdy + y(dx)^2 = 0, \frac{D}{4} = (xy)^2 - xy,$

at the point (1; 1) we have: $\frac{D}{4}\Big|_{\substack{x=1\\y=1}} = 1^2 - 1 = 0 \Rightarrow$ the equation is of parabolic type at the point (1; 1).