Quiz. 2 Quiz C

Descriptive

$$\begin{cases} u_x - 3u_y = u^2 \\ u(x,0) = 1 \end{cases}$$

The Characteristics Eqn. is given by

$$\begin{cases} x'(t) = 1, & x(0) = s \\ y'(t) = -3, & y(0) = 0 \\ z'(t) = z^2(t), & z(0) = 1. \end{cases}$$

3 - marks for writing all three correctly. (1 - for each Equations)

Then we get

Solving

$$\begin{cases} x(t) = t+s \\ y(t) = -3t \\ \frac{1}{z(t)} = 1-t \end{cases} \Rightarrow z(t) = \frac{1}{1-t} \quad \rightarrow (*)$$

(2) mark for writing all of the above correctly.

(you can give 1- marks even if one of the Eqn. out of above 3- is correct).

Therefore Eliminating 't' from $z(t)$ we get

$$\boxed{u(x,y) = z(t) = \frac{3}{3+y}}$$

(2) marks for getting this.

Eliminating 't' from (*) above

we get

$$y + 3x = 3s.$$

is the Equation of the projected characteristics from $(s,0)$, which are parallel lines with gradient (-2).

They do not intersect.

* The last step may be obtained by directly intersecting
$$y + 3x = s_1$$
$$y + 3x = s_2$$
$$\Rightarrow s_1 = s_2$$

Or, If Some one says as the Eqn. is Semilinear. for which we know Projected characteristics do not intersects. Give them 1 marks).