

W6 Q2

$$u = u(x, y)$$

$$u_x + 2u_y = 2x - y \quad \text{let } s = x + 2y \quad t = 2x - y$$

$$\begin{aligned} \frac{\partial u}{\partial x} &= \frac{\partial u}{\partial s} \frac{\partial s}{\partial x} + \frac{\partial u}{\partial t} \frac{\partial t}{\partial x} & \frac{\partial u}{\partial y} &= \frac{\partial u}{\partial s} \frac{\partial s}{\partial y} + \frac{\partial u}{\partial t} \frac{\partial t}{\partial y} \\ &= \frac{\partial u}{\partial s} (1) + \frac{\partial u}{\partial t} (2) & &= \frac{\partial u}{\partial s} (2) + \frac{\partial u}{\partial t} (-1) \end{aligned}$$

$$\begin{aligned} \frac{\partial u}{\partial x} + 2 \frac{\partial u}{\partial y} &= \frac{\partial u}{\partial s} + 2 \frac{\partial u}{\partial t} + 2 \left(\frac{\partial u}{\partial s} (2) + \frac{\partial u}{\partial t} (-1) \right) \\ &= 5 \frac{\partial u}{\partial s} = 2x - y \end{aligned}$$

$$\frac{\partial u}{\partial s} = \frac{2x - y}{5}$$

$$\int \frac{\partial u}{\partial s} ds = \int \frac{2x - y}{5} ds$$

$$u = \left(\frac{2x - y}{5} \right) s + f(t) \quad f \text{ is arbi.}$$

$$u(x, y) = \left(\frac{2x - y}{5} \right) (x + 2y) + f(2x - y)$$