

MATH 3403
TUTORIAL SHEET 1

1. Determine the characteristic through the point $(1, 1)$ for the linear operator

$$(x + 2)u_x + 2yu_y .$$

If

$$(x + 2)u_x + 2yu_y = 2u ,$$

and $u(1, 1) = 1$, determine $u(4, 4)$.

2. Determine the characteristic through the point $(1, -1)$ for the linear operator

$$x^2u_x - y^2u_y .$$

If

$$x^2u_x - y^2u_y = u ,$$

and $u(1, -1) = 1$, determine $u(2, -2)$.

Find the solutions of the following equations, indicating the regions in which the solutions are defined.

3. $u_x + u_y = 1$; $u = \phi(s)$ on $x = s, y = 2s$.

4. $x^2u_x - y^2u_y = 0$; $u(1, y) = F(y)$.

5. $xu_x + yu_y = 3$; $u(1, y) = \log y$, $y > 1$.

6. $yu_x + xu_y = u$; $u(x, 0) = e^{-x}$.

Assignment Questions 2 and 5.