

3. Solve the equation  $(1 + x^2)u_x + u_y = 0$ . Sketch some of the characteristic curves.
7. (a) Solve the equation  $yu_x + xu_y = 0$  with  $u(0, y) = e^{-y^2}$ .  
(b) In which region of the  $xy$  plane is the solution uniquely determined?