Problem 1
Find the solution of \((x + 1)^2 u_x + (y - 1)^2 u_y = (x + y)u\) and satisfying the condition \(u(x, 0) = -1 - x\) for \(-1 < x < \infty\). Where in the \(xy\)-plane is \(u(x, y)\) determined by these conditions?

Problem 2
Show that all the projected characteristic curves of
\[(2x + u)u_x + (2y + u)u_y = u\]
through the point \((1, 1)\) are given by the straight line \(y = x\).

Problem 3
Solve the equation
\[(2x - y)^2 u_x + 8(y - 2x) x^2 u_y = 2(4x^2 + y^2) u\]
with Cauchy data \(u(x, 0) = \frac{1}{2x}\) for \(0 < x < 8\).

Problem 5
Solve the equation \((u_x)^2 + (u_y)^2 = 1\) with initial data given by \(s \rightarrow (\sin s, \cos s, 0)\) for \(0 \leq s \leq \pi/2\). Based on the method of characteristics, where in the \(xy\)-plane is \(u(x, y)\) determined by these conditions?

Problem 6
Problem 4, section 1.3 McOwen book, page 41.