Cauchy Problem for Quasilinear First-Order PDEs

Exercises

Notations: $z = z(x, y)$, $p = z_x$ and $q = z_y$

1. Find the integral surface which passes through the given curve

   a. $z(p - q) = y - x;\ x = 1, z = y^2$

   b. $(x + z)p + (y + z)q = 0;\ x = 1 - t,\ y = 1 + t,\ z = t$

   c. $x^2p + y^2q = z^2;\ x = t,\ y = 2t,\ z = 1$

   d. $(x^2 + y^2)p + 2xyq = xz;\ x = a,\ y^2 + z^2 = a^2$

   e. $(\sec x)\ p + aq = (\cot y)z;\ z(0, y) = \sin y$

   f. $z(x + z)p - y(y + z)q = 0;\ x = 1,\ y = t,\ z = \sqrt{t}.$