Extra Problems

1.2 $\qquad u_x + 2u u_y = 1 \qquad u(x,1) = 1 \qquad -\infty < x < \infty$

I.C. $\quad x = s \quad y = 1 \quad u = 1$

$\frac{dx}{dt} = 1 \qquad \frac{dy}{dt} = 2u \qquad \frac{du}{dt} = 1$

$x = t + A \qquad u = t + C \qquad \frac{dy}{dt} = 2t + 2C$

$y = t^2 + 2Ct + B$

Impose I.C. $\quad t = 0 \quad 1 = B \quad s = A \quad 1 = C$

$\therefore$

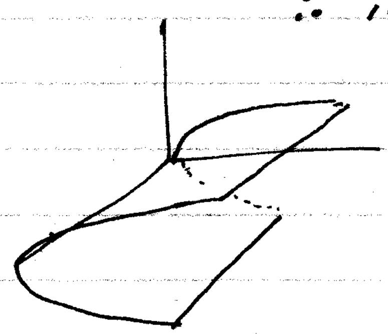
parameterized surface is

4 $\qquad x = t + s \quad y = t^2 + 2t + 1, \; u = t + 1$

$\therefore$ it is the surface $y = u^2$

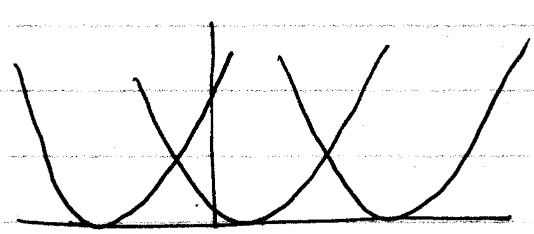
$=$ parabolic cylinder

I.C. is a $u = 1 \;\therefore\; u = +\sqrt{y}$



2 a) $u = \sqrt{y}$

1 b)



$y = (x-s)^2 + 2(x-s) +$

$= (x - s + 1)^2$

1 c) No. only in the region $y \geq 0$

1 d) parabolic cylinder $\qquad$ e) the top half

1 f) There are 2 solutions $u = \sqrt{y}$, $u = -\sqrt{y}$.