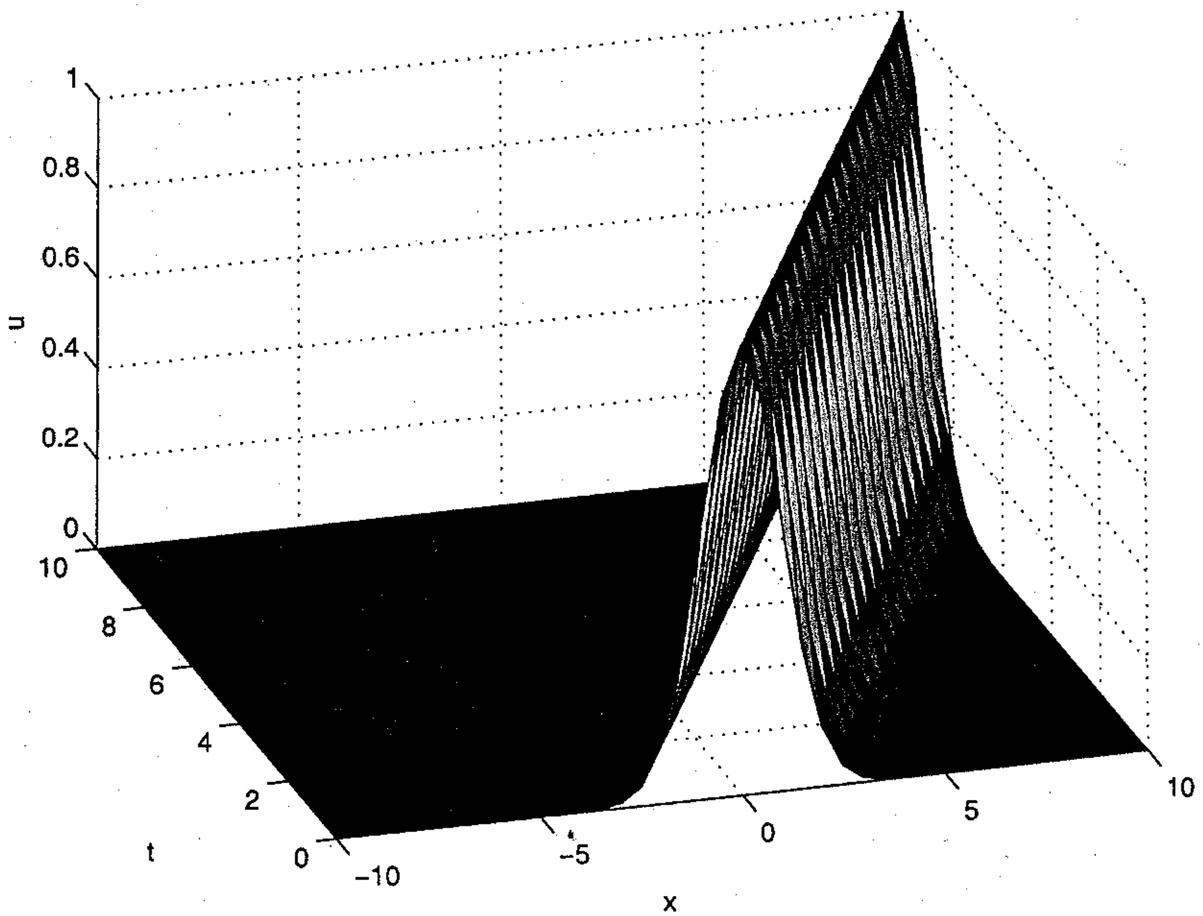
Visualization of the solution $u(x,t)$ to

$$\begin{cases} \dfrac{\partial u}{\partial t} + \dfrac{\partial u}{\partial x} = 0 \\ u(x,0) = e^{-x^2/2} \end{cases}$$

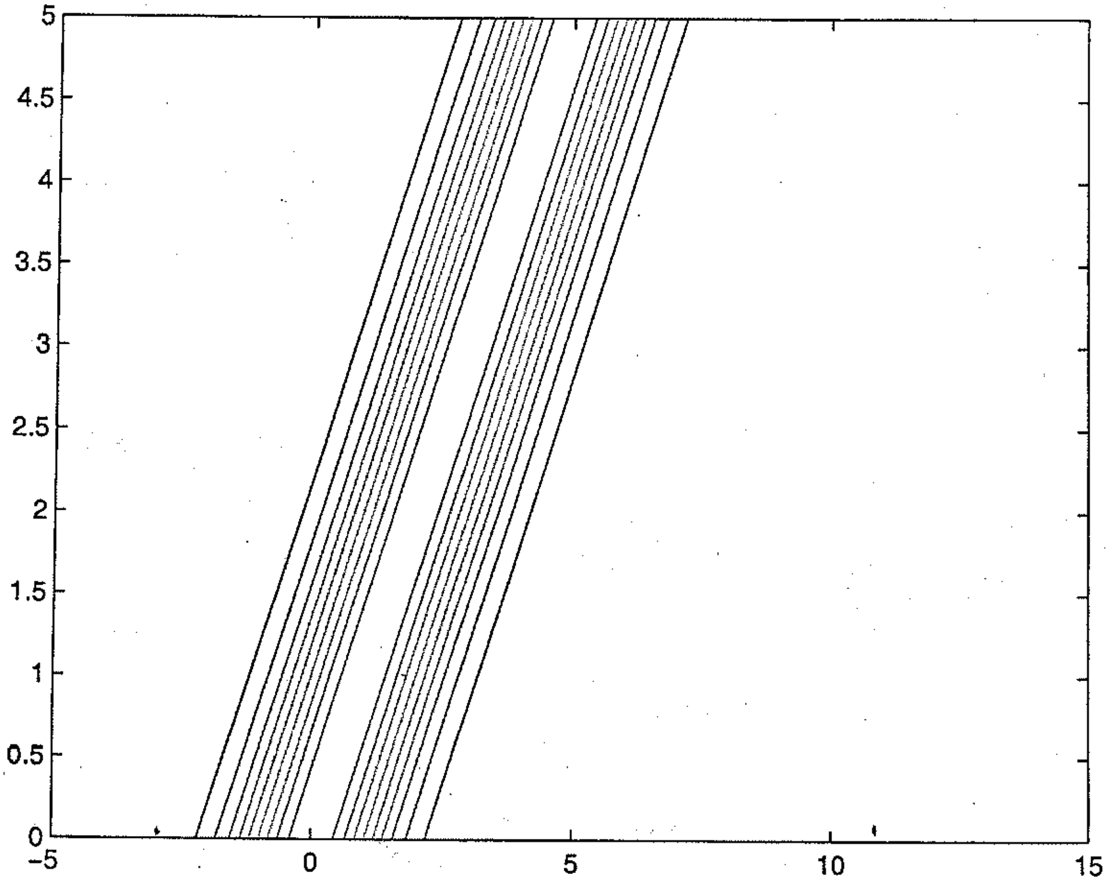
As a surface $u = u(x,t)$ in the 3-D space (x,t,u)



Contour levels of $u(x,t)$ solution of

$$\begin{cases} \frac{\partial u}{\partial t} + \frac{\partial u}{\partial x} = 0 \\ u(x,0) = e^{-x^2/2} \end{cases}$$

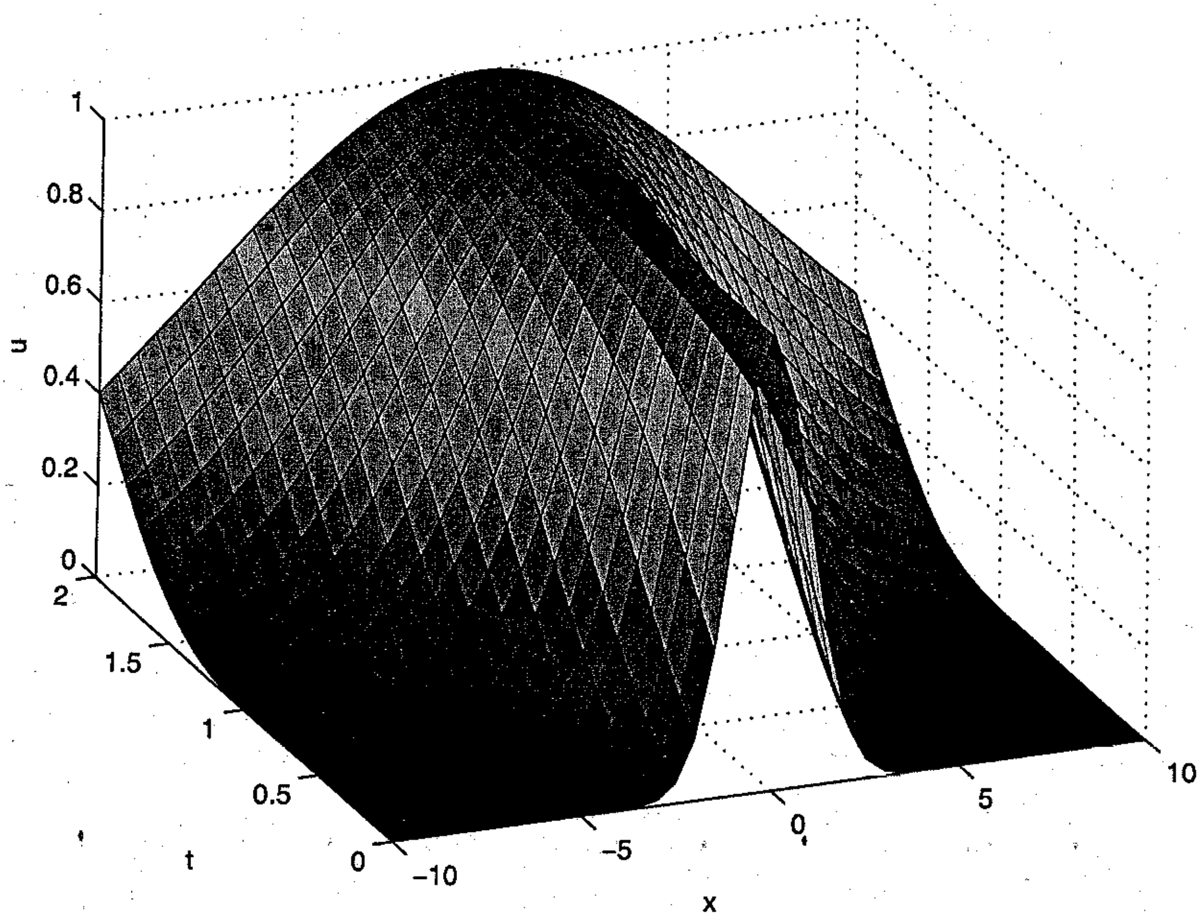
The contours are also characteristics of the equation since $\frac{\partial u}{\partial \tau}$ is null on the characteristic.



Visualization of the solution $u(x,t)$ to

$$\begin{cases} \frac{\partial u}{\partial t} + x\frac{\partial u}{\partial x} = 0 \\ u(x,0) = e^{-x^2/2} \end{cases}$$

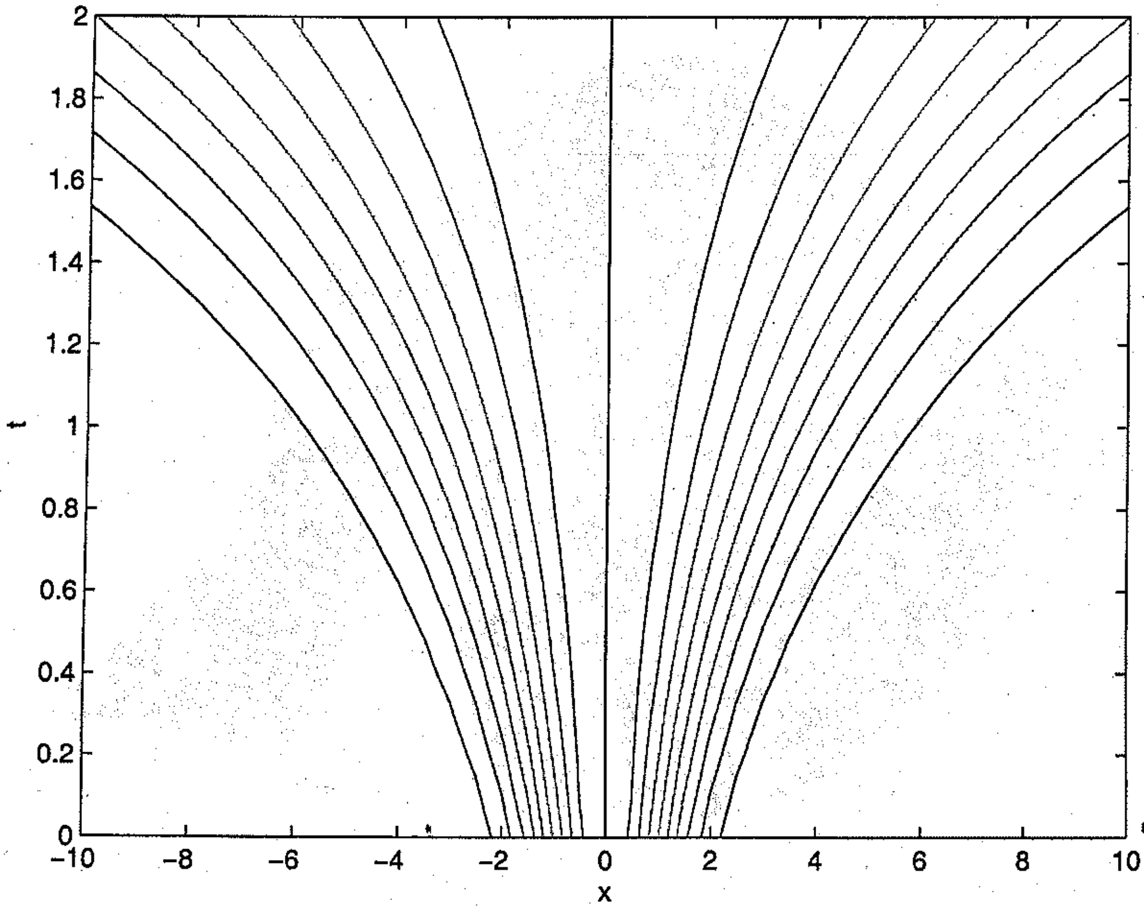
as a surface



Contour levels of the solution $u(x,t)$

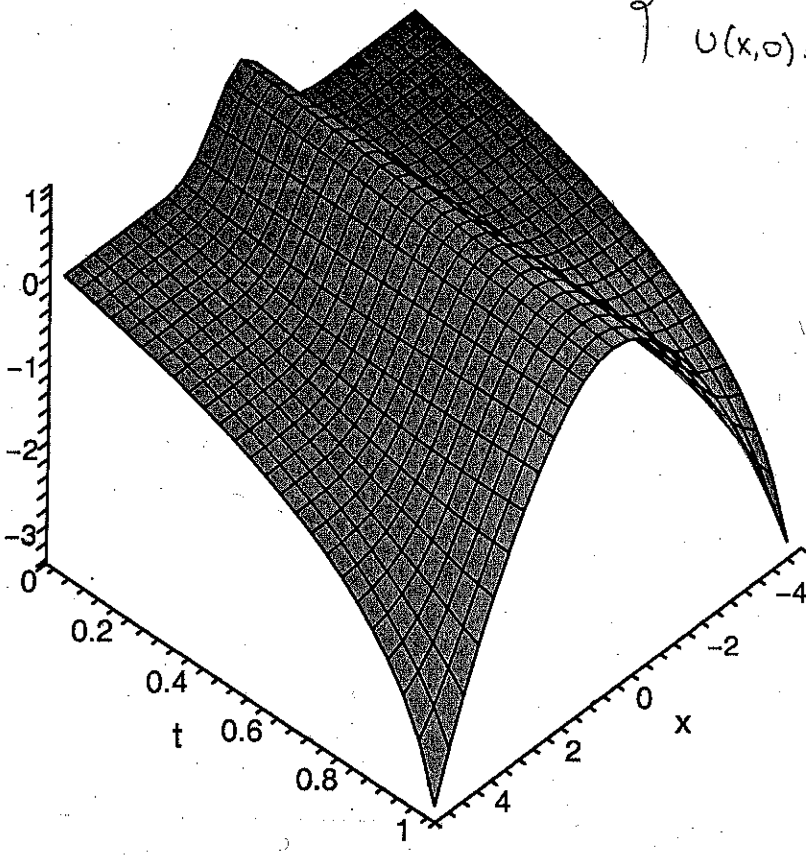
to $\begin{cases} \frac{\partial u}{\partial t} + x \frac{\partial u}{\partial x} = 0 \\ u(x,0) = e^{-x^2/2} \end{cases}$

The contours are also characteristics of the equation since $\frac{\partial u}{\partial \tau}$ is null on a characteristic



Solution 2 Contour plot for

$$\begin{cases} u_t + x u_x = -e^{-u} \\ u(x,0) = e^{-x^2} \end{cases}$$



Note that contour lines & characteristics do <u>not</u> coincide.