Linear MOC example

The pde and initial condition are given by

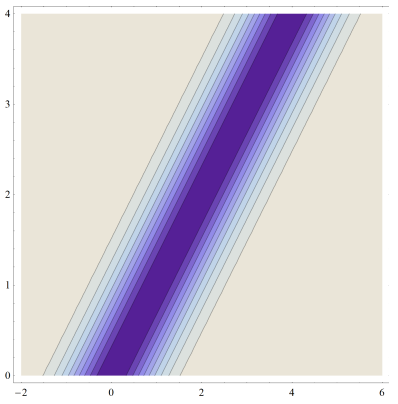
$$u_t + u_x = 0, \ -\infty < x < \infty, \ t > 0, \text{ with } u(x,0) = e^{-x^2}.$$

Using the method of characteristics (MOC), the solution is given by

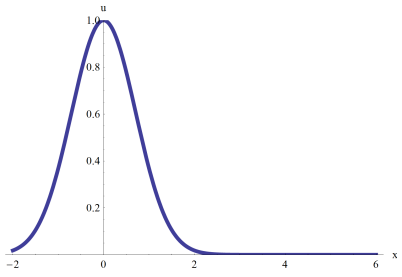
$$u = \exp\left[-(x-t)^2\right].$$

The characteristics are the straight lines in space-time given by

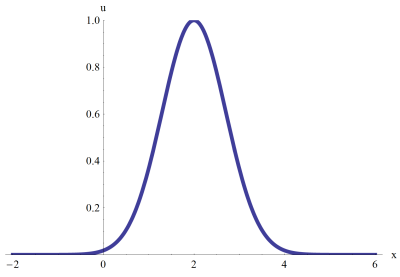
$$\tau = x - t \Longleftrightarrow x = t + \tau \text{ for fixed } \tau.$$



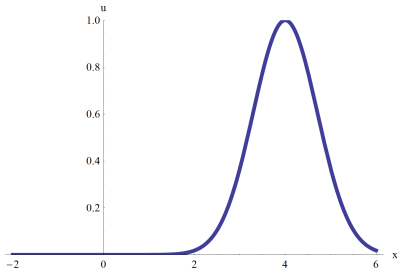
Contour plot of $u(x,t)$



$u(x,0)$



$u(x,2)$



$u(x,4)$