

Find the solution $u(x,y,t)$ of the wave equation

$$u_{tt} = u_{xx} + u_{yy}, u(x, y, 0) = xy$$

Which satisfies the form $u(x,y,t)=f(2t-x,y)$, where f is a smooth function of two variable .

By the initial condition $u(x,y,0)=f(-x,y)=xy$, then $f(p,q)=-pq$,

Where $p=2t-x$, $q=y$

$$u(x,y,t)=y(x-2t)$$