Construct infinitely differentiable functions $M(x,y), N(x,y)$ on $R^2\backslash(0,0)$ satisfying

$$\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$$

and such that there does not exists a function $H(x,y)$ on $R^2\backslash(0,0)$ satisfying

$$\frac{\partial H}{\partial x} = M, \frac{\partial H}{\partial y} = N$$