Assignment

I. Solve the following PDEs by separation of variables:

1. $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=0$

2. $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3\left(x^2+y^2\right)u$

3. $4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u\ ;\ u(0,y)=e^{-5y}$

4. $y^3\frac{\partial u}{\partial x}+x^2\frac{\partial u}{\partial y}=0$

Answers:

1. $u=c\left(\frac{x}{y}\right)^k$

2. $u=ce^{x^2+y^3+k(x-y)}$

3. $u=e^{2x-5y}$

4. $u=c\,e^{k\left(\frac{x^3}{3}-\frac{y^4}{4}\right)}$