PARTIAL DIFFERENTIAL EQUATIONS
SPRING 2023

ASSIGNMENT 2.1
DUE JANUARY 24

**(a)** Find the general solution to the given partial differential equation and **(b)** use it to find the solution satisfying the given initial data.

**Exercise 1.** $2\dfrac{\partial u}{\partial x} - \dfrac{\partial u}{\partial y} = (x+y)u$

$u(x,x) = e^{-x^2}$

**Exercise 2.** $\dfrac{\partial u}{\partial x} = -(2x+y)\dfrac{\partial u}{\partial y}$

$u(0,y) = 1 + y^2$

**Exercise 3.** $y\dfrac{\partial u}{\partial x} + x\dfrac{\partial u}{\partial y} = 0$

$u(x,0) = x^4$

**Exercise 4.** $\dfrac{\partial u}{\partial x} + 2y\dfrac{\partial u}{\partial y} = e^{-x} - u$

$u(0,y) = \arctan y$

**Exercise 5.** $\dfrac{\partial u}{\partial x} + v\dfrac{\partial u}{\partial y} = -ru$ (here $r$ and $v \neq 0$ are constants)

$u(x,0) = \dfrac{\sin x}{x}$