



(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.
$$y \frac{\partial u}{\partial x} + x \frac{\partial u}{\partial y} = 0$$
$$u(x, 0) = x^4$$

Exercise 2.
$$2 \frac{\partial u}{\partial x} - \frac{\partial u}{\partial y} = (x + y)u$$
$$u(x, x) = e^{-x^2}$$

Exercise 3.
$$\frac{\partial u}{\partial x} = -(2x + y) \frac{\partial u}{\partial y}$$
$$u(0, y) = 1 + y^2$$

Exercise 4.
$$\frac{\partial u}{\partial x} + 2y \frac{\partial u}{\partial y} = e^{-x} - u$$
$$u(0, y) = \arctan y$$

Exercise 5.
$$\frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} = -ru$$
$$u(x, 0) = \frac{\sin x}{x}.$$