PARTIAL DIFFERENTIAL EQUATIONS
SPRING 2017

ASSIGNMENT 3.1
DUE FEBRUARY 2

For each of the partial differential equations below find the solution that satisfies the given initial data.

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

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

Exercise 2. $\dfrac{1}{u}\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = u$

$u(0, y) = 1 - y$

Exercise 3. $y\dfrac{\partial u}{\partial x} + x\dfrac{\partial u}{\partial y} = \dfrac{xy}{u^2}$

$u(x, 3x) = \dfrac{x^2}{1 + x^2}$

[*Suggestion:* At some point consider $y^2 - x^2$. Alternatively, divide through by xy first.]

Exercise 4. $(x + 4y)\dfrac{\partial u}{\partial x} + (3x + 2y)\dfrac{\partial u}{\partial y} = x(1 + u^2)$

$u(8y, y) = \tan(y)$