Homework 3

- By inspiring yourself from the question 2.3(c) and its solution, find all of the possible solutions of the PDE

$$xu_x + yu_y = u + 1$$
$$u(x, x) = x^2$$

- Find the solution of the PDE

$$xuu_x + yuu_y = u^2 - 1$$
$$u(x, x^2) = x^3 \text{ for } x > 0$$

  and discuss (using the transversality condition) what happens at $x = 0$.

- Complete the lecture notes by looking at the traffic flow problem with an initial velocity profile with $\frac{U_{\max}}{2} < u(x, 0) < U_{\max}$.

- Invent another possible flux law for the traffic flow (i.e. propose a new $V(N)$) and discuss the behavior of the solutions.

- Problems 7.1 - 7.7 in Phone Lines handout (good preparation for next lecture!)
