Suggested problems. Set 1.

- Section 1.1: 5 (a); 6 (b); 7 (a); 8.

- Find a solution of the equation

$$u_x + 2u_y = 0,$$

such that the graph of this solution passes through the curve

$$x = s + s^2, \quad y = 2s^2, \quad z = s^2.$$

- Section 1.2: 1, 7.

- Proof that the only solutions to the equation

$$u^3 u_x + u_y = 0$$

in all of $\mathbb{R}^2$ are constants.

- Proof that the initial value problem

$$xu_x + tu_t = u^3, \quad u(x, 0) = x,$$

has no solution.

- Solve the initial value problem

$$u^2 u_x + tu_t = u, \quad u(x, 0) = x.$$

- Section 1.3: 2, 4, 6, 7, 10.

- Solve the initial value problem

$$xu_x + yu_y + u_x u_y = u, \quad u(s, 0) = s^2.$$

Try both characteristic strips and envelopes of affine solutions. Which method is easier in this case?