EXERCISES, Week 12 (submit by 16.01.2017)

1. Identify the type of the following PDEs.
   (a) $\sin^2 y\, u_{xx} - e^{2x}\, u_{yy} + u_x = 0$
   (b) $(x-y)\, u_{xx} + (xy - y^2 - x + y)\, u_{xy} = 0$

2. For each of the following PDEs, find a change of variables that brings it to its canonical form.
   (a) $y\, u_{xx} - x\, u_{yy} = 0$
   (b) $y^2\, u_{xx} - e^{2x}\, u_{yy} + u_x = 0$

3. Write the following PDEs in their canonical forms.
   (a) $e^{2x}\, u_{xx} + 2e^{x+y}\, u_{xy} + e^{2y}\, u_{yy} + u_y = 0$
   (b) $u_{xx} + xy\, u_{yy} = 0$

4. Simplify the following PDE by changing the unknown function to $v(x,y)$, where $u(x,y) = e^{\lambda x + \mu y} v(x,y)$, and choosing the parameters λ, μ suitably.

$$u_{xx} + u_{yy} + \alpha\, u_x + \beta\, u_y + \gamma u = 0.$$