

**Math in Moscow, 2013-14 academic year****Ordinary differential equations****Exercises for lesson 2 (02/17/2014)***Ilya Schurov*

**Problem 1.** Find all solutions of an equation in form  $y = y(x)$ . Sketch corresponding direction field and integral curve.

(a)  $y' = y/x$ ;                      (b)  $y' = 2y/x$ ;                      (c)  $y' = -x/y$ ;                      (d)  $y' = xy$ ;

**Problem 2.** Solve the following equations (it is not needed to express the solution as a functions of  $x$ ):

(a)  $(x^2 + 4)y' = 2xy$ ;                      (b)  $y' = -xe^y$ ;

**Remark 1.** *Sometimes you have to make a substitution to solve an equation.*

**Problem 3.** Solve the following equations (it is not needed to express the solution as a functions of  $x$ ):

(a)  $y' = \frac{y(1+xy)}{x(1-xy)}$ ;                      (c)  $y' = \sin(x + y)$ ;  
(b)  $y' = -\frac{x+y+1}{4x+4y+10}$ ;                      (d)  $y' = \sqrt{4x + 2y - 1}$ .