

Math in Moscow, 2014-15 academic year**Ordinary differential equations** (<http://math-info.hse.ru/s14/12>)**Exercises for lesson 3 (02/26/2015)***Ilya Schurov***Problem 1.** For the following systems of ODE:

- Draw vector field and sketch phase curves.
- Solve system.
- Find phase curves.
- Solve corresponding non-autonomous ODE.

(a) $\dot{x} = 0, \quad \dot{y} = 0;$

(c) $\dot{x} = x, \quad \dot{y} = y;$

(e) $\dot{x} = x, \quad \dot{y} = -y;$

(b) $\dot{x} = 1, \quad \dot{y} = y;$

(d) $\dot{x} = 2x, \quad \dot{y} = y;$

(f) $\dot{x} = x^2, \quad \dot{y} = -y;$

Problem 2. Consider system:

$$\dot{x} = -y, \quad \dot{y} = x.$$

- Draw vector field.
- Sketch phase curves.
- Solve corresponding non-autonomous ODE.
- Draw phase curves.