Math in Moscow, 2014-15 academic year
Ordinary differential equations (http://math-info.hse.ru/sl4/12)
Exercises for lesson 3 (02/26/2015)
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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) $\dot{x} = 0, \quad \dot{y} = 0$;  
(b) $\dot{x} = 1, \quad \dot{y} = y$;  
(c) $\dot{x} = x, \quad \dot{y} = y$;  
(d) $\dot{x} = 2x, \quad \dot{y} = y$;  
(e) $\dot{x} = x, \quad \dot{y} = -y$;  
(f) $\dot{x} = x^2, \quad \dot{y} = -y$;

Problem 2. Consider system:

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

(a) Draw vector field.  
(b) Sketch phase curves.  
(c) Solve corresponding non-autonomous ODE.  
(d) Draw phase curves.