IUM and HSE, 2013-14, «Ordinary differential equations»
Math in Moscow, 2013-14 academic year
Ordinary differential equations
Exercises for lesson 3 (02/24/2014)
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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.