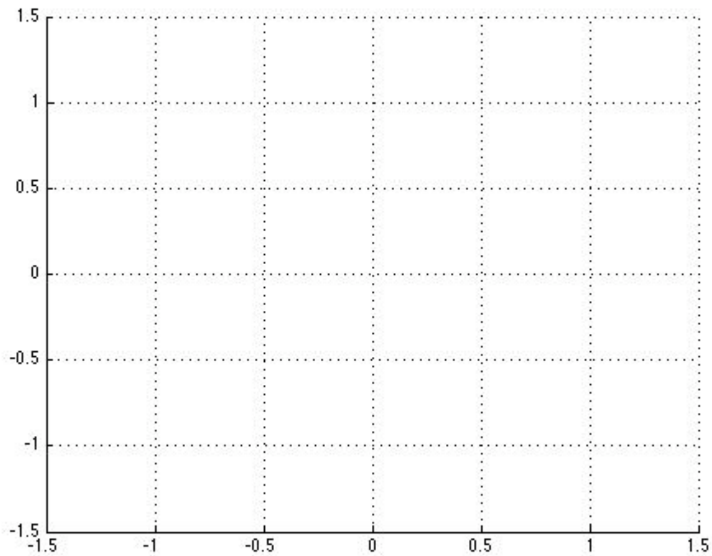
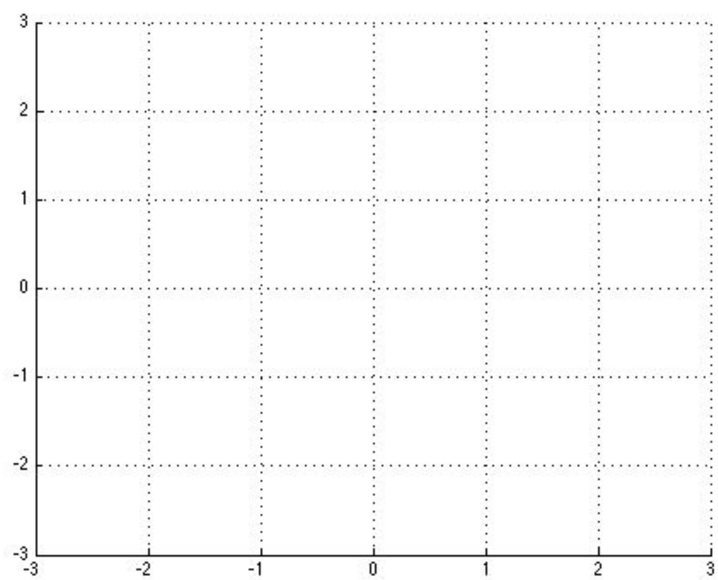
Maths 260 Lecture 3: Pictures from the lecture

This lecture uses many pictures to help explain the ideas. To help you during the lecture, copies of the pictures used by the lecturer are provided here.

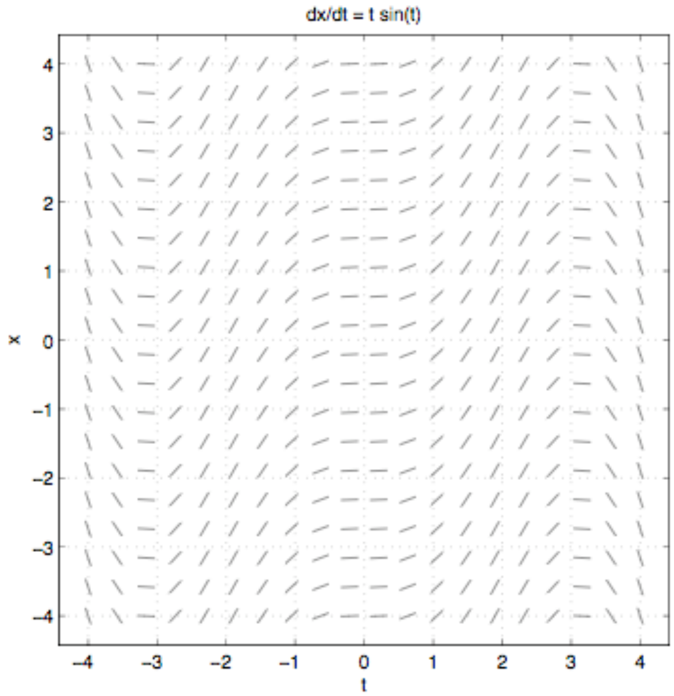
Example 1: Use the grid provided to draw the slope field for the DE $\frac{dy}{dt} = y - t$



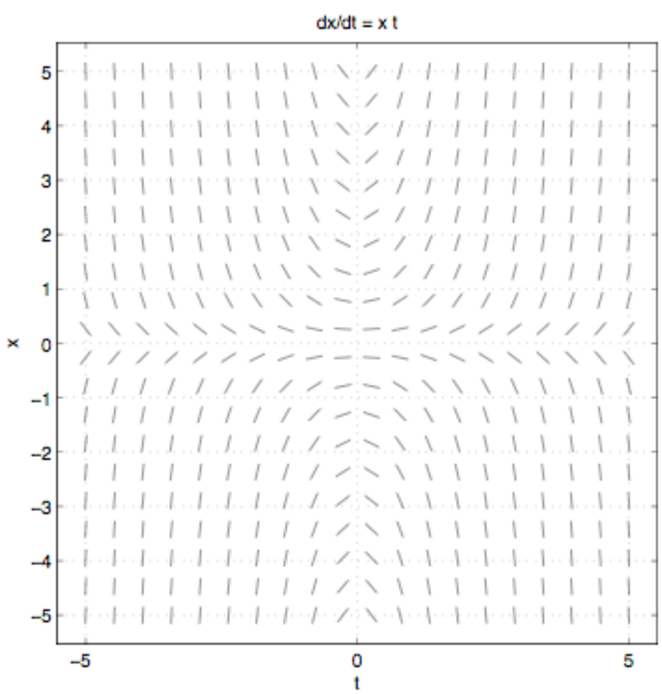
Example 2: Draw the slope field for the DE $\frac{dy}{dt} = -yt$



Example 3: The following picture shows the slope field for the DE $\frac{dy}{dt} = t\sin t$. Sketch solutions to this DE satisfying: (a) y(1)=0; (b) y(0)=-1.



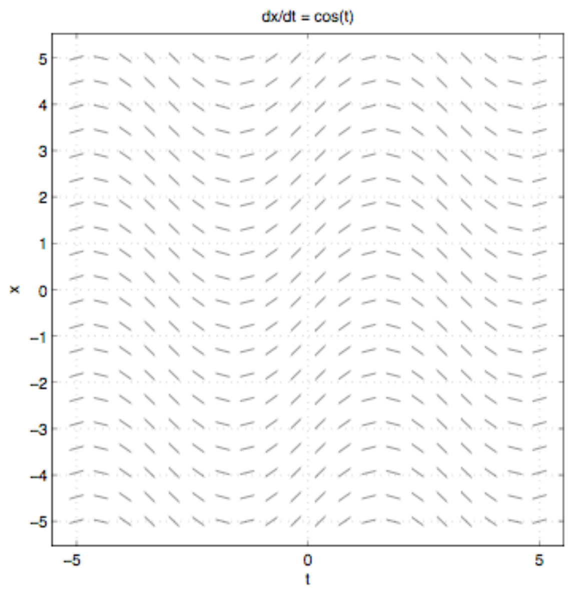
Example 4: The following picture shows the slope field for the DE $\frac{dy}{dt} = yt$. Draw solutions to this DE satisfying: (a) y(1)=0; (b) y(0)= -1.



Two special cases:

For DEs of the form $\frac{dy}{dt} = f(t)$ the slope marks on each line of fixed t in the slope field are parallel.

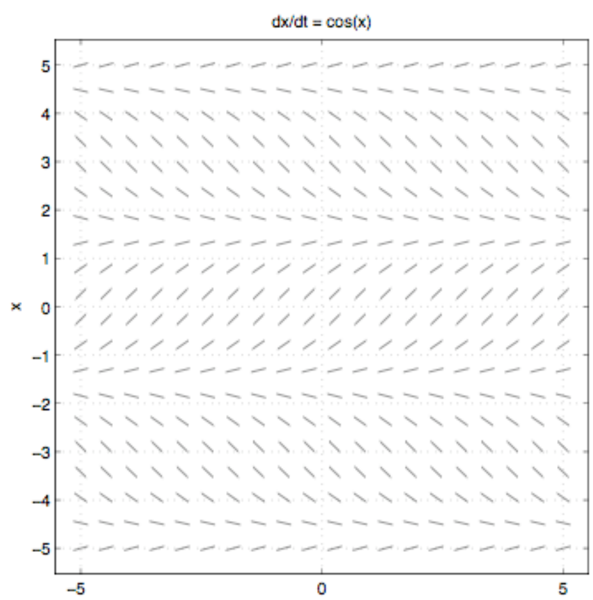
Example 5: $\frac{dy}{dt} = \cos t$



Graphs of different solutions are vertical translations of each other.

For DEs of the form $\frac{dy}{dt} = f(y)$ the slope marks on each line of fixed x in the slope field are parallel.

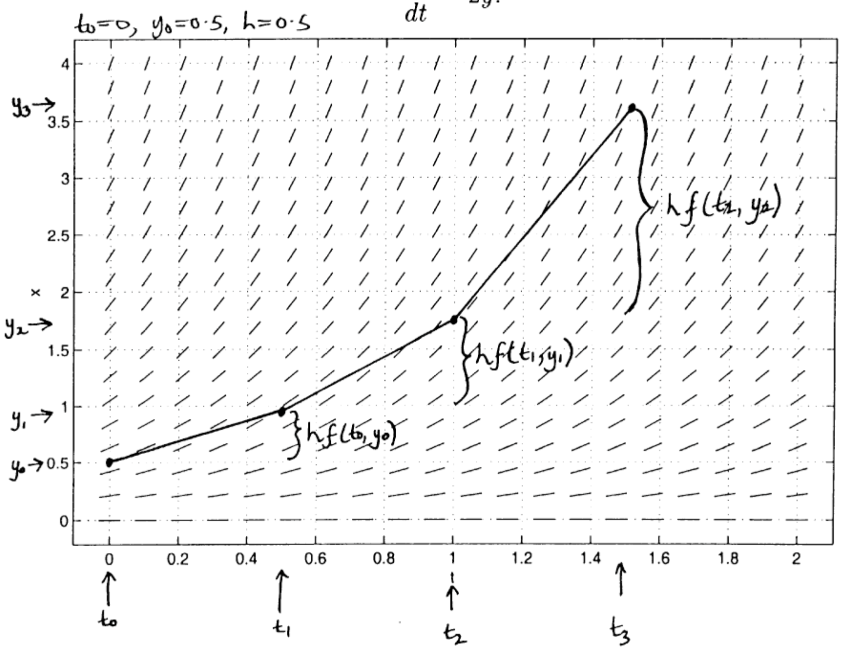
Example 6: $\frac{dy}{dt} = \cos y$



The horizontal translation of a solution curve is also a solution.

The relationship between the slope field and the numerical solution obtained from Euler's method is shown below for one particular DE:

$$\frac{dy}{dt} = 2y.$$



Example 7: Use Euler's method to approximate the solution of $\frac{dy}{dt} = \sqrt{t^2 + y^2},\ y(0) = 0.75$ at t=0.25, t=0.5, t=0.75, and t=1. Compare the results with the solution sketched using the slope field: