

620-151 BIOMEDICAL MATHEMATICS

Lecture Supplement

Example of a Slope Field

y' = x - y

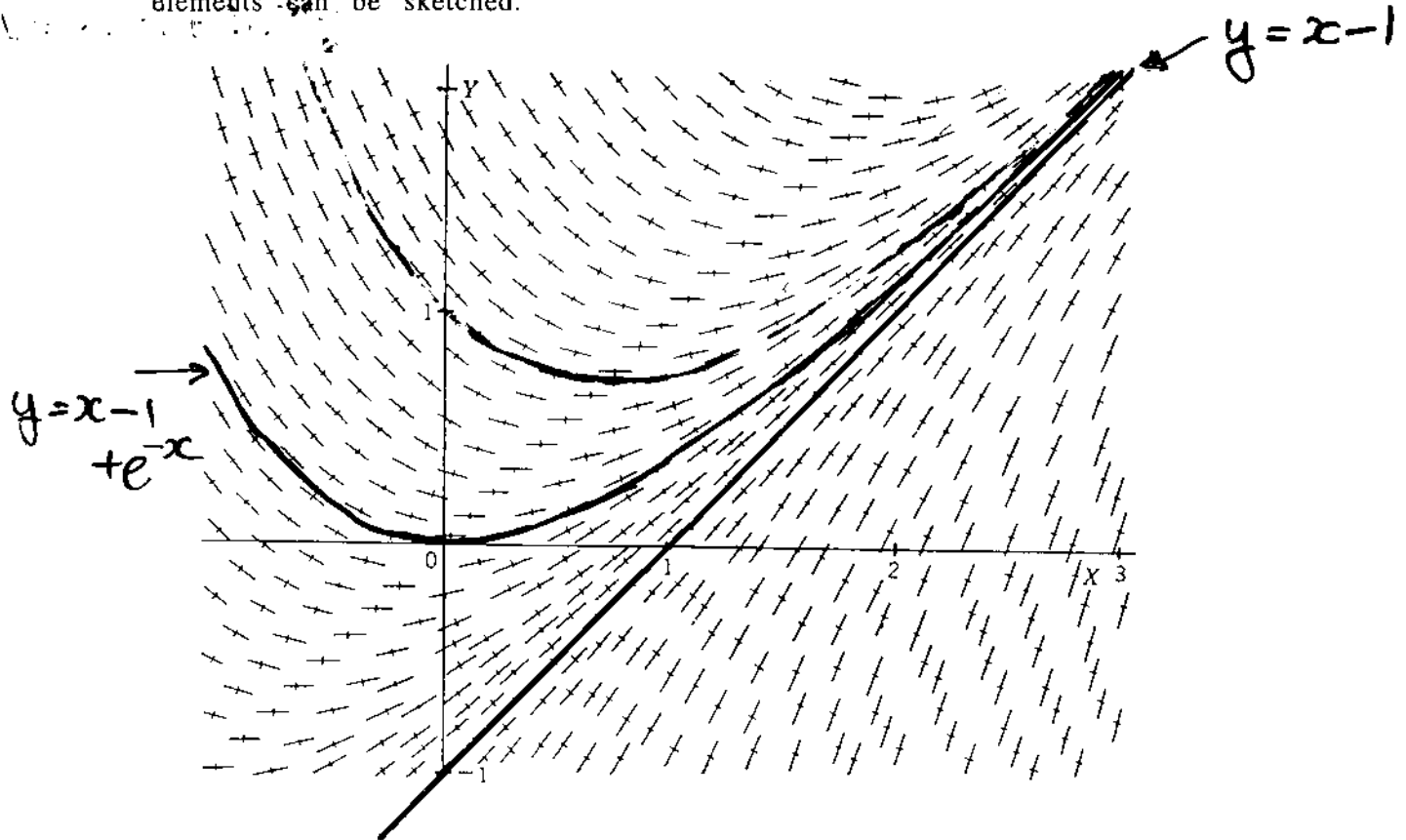
Let us consider the differential equation dy/dx = x - y .

This equation defines a slope (dy/dx) of some function y(x) at any point in the x, y plane.

If a solution curve of the differential equation passes through some particular point (x, y), we can calculate the slope of the curve at that point. For instance, at (1, 1), dy/dx = 1 - 1 = 0 , and at (1, 2), dy/dx = 1 - 2 = -1 .

Let us draw, through a particular point in the x, y plane, a small straight line element with the calculated slope. This small element will be tangent to the solution curve at that point.

The set of all such line elements for the differential equation is called the slope field of the differential equation. In practice, only a selection of line elements can be sketched.



D.E.: dy/dx = x - y .

Some Particular Solutions:

General Solution:

$y(0) = 0, y = x - 1 + e^{-x}$   
 $y(0) = 1, y = x - 1 + 2e^{-x}$   
 $y(0) = -1, y = x - 1$

$y = x - 1 + A e^{-x}$   
 (A is a constant)  
 $-\infty < A < \infty$