

9.1 Direction Fields

Lineal Elements

Suppose we want to solve $y' = y$

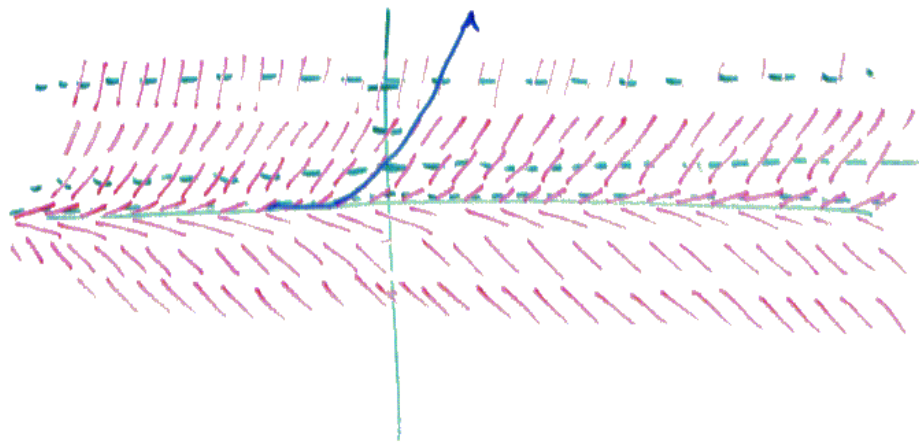
The diff. eq. implies the slope of the tangent lines are given by

$$\frac{dy}{dx} = f(x, y).$$

In this case, $f(x, y) = y$.

Where is it constant? $y = c \Rightarrow$ lines ^{horiz.}

So, at $y = 3$, each possible solution to the diff. eq. has a slope of 3.



Isoclines Any member of $f(x,y)=c$
is called an isocline.

The totality of all these lineal elements
is called a direction field.

Sketch the direction field of

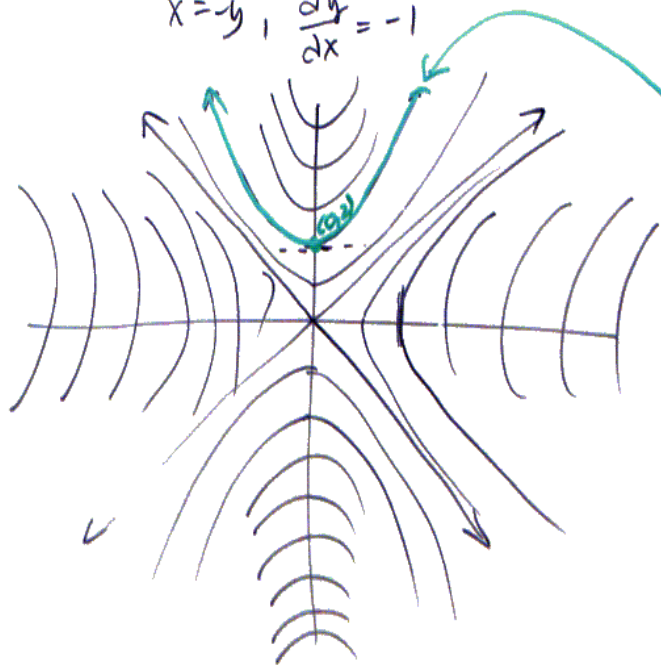
$$\frac{dy}{dx} = \frac{x}{y}$$

If it crosses y -axis, $\frac{dy}{dx} = 0$

x -axis, $\frac{dy}{dx} = \pm\infty$

$$\text{If } x=y, \frac{dy}{dx} = 1$$

$$x=-y, \frac{dy}{dx} = -1$$



Suppose you
know that
 $y(0)=2$.

The solution
is the one
that passes
through $(0,2)$