Geometric Methods: Introduction

In studying the first order ODE $y' = f(x, y)$ the main emphasis is on learning different ways of finding explicit solutions. However, you should realize that most first order equations cannot be solved explicitly. For such equations, one tool we can resort to is graphical methods. Mostly we will use the computer to make the visualizations. But we will also learn to carry them out by hand to give rough qualitative information about how the graphs of solutions to the differential equation look geometrically.

We first introduce the basic protagonists of graphical methods: direction fields, isoclines and integral curves; the latter correspond to solutions. Look out for the intersection principle, a key theorem about them. The *isoclines applet* is a great tool for getting a feel for geometric methods; make sure to familiarize yourself with it. It will be particularly important for illustrating the power of graphical methods for understanding long-term behavior of solutions –the final topic in this session.

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