

# Lab 10: Vector Calculus

**Lab10.ma** is a *Mathematica* notebook that extends the work of Lab 5. It shows how to plot vector fields, gradient fields, and Hamiltonian fields. It shows that the gradient and Hamiltonian fields are orthogonal. It uses the **ContourPlot** command to obtain streamlines through the Hamiltonian field. It defines the **Grad**, **Div**, and **Curl** operators and verifies certain identities involving them.

Like all *Mathematica* notebooks, this one is used by opening its cells and executing its *Mathematica* commands. To open a cell, double-click on its cell bracket. To execute a *Mathematica* command, click on its cell bracket to select it, and then press the Enter key (not the Return key).

**Lab10.wn** explains how to work through **Lab10.ma** on the NeXT.

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## Category:

Mathematics

## Usage:

This software is used by students enrolled in Multivariate Calculus at the University of Richmond.

## Version:

This software uses Mach 2.0

and *Mathematica* 2.0

## References:

This software refers to the two books:

*Calculus and Analytic Geometry*, Fourth Edition  
by Sherman K. Stein (McGraw-Hill, 1987).

*A Guidebook to Calculus with Mathematica*  
by Philip Crooke and John Ratcliffe (Wadsworth, 1991).