Calculus III
Spring 2009

Topic Review Worksheet

This worksheet is intended to help guide your studying for the upcoming midterm exam. I've done my best to include as many of the essential topics that will be included on the exam as I can, but I make no promise that this list is exhaustive; in other words, it's not my fault if I've forgotten something! Fill in the blank entries of each row of the table below (I've filled in the row on the gradient vector to provide an example), and answer the questions that follow. The more information you can provide, the better. These are the kinds of things that I expect everyone to be able to recall almost instantly, so be sure you know them backward and forward! And don't forget to find and work through as many examples ("Practice problems, anyone?") as you can.

Object	**Symbol**	**Meaning**	**How it's computed**
Contour of $f(x, y)$			
		The collection of points in $\mathbb{R}^3$ where $f(x, y, z)$ takes on the value k	
Partial derivative of $f(x, y)$ with respect to x			
	NA	The plane that best approximates $f(x, y)$ near (a, b)	

The gradient vector	∇f	The direction of the greatest increase of f at a given point; it's length is the rate of change of f in that direction	$\nabla f = \langle f_x, f_y \rangle$ (for functions of 2 variables)
	$D_{\mathbf{u}} f$		
Normal vector to a level curve or level surface			
Lagrange multiplier			
Critical point of f	NA		
	$\iint_R f(x,y)\,dA$		

1. What does it mean for a multivariable function to be differentiable? How can this be tested without going back to the definition?
2. What is the purpose of the chain rule? What's are "tree diagrams"? How are they used?
3. How are local extrema of a function of several variables found? How can minima, maxima and saddle points be distinguished from one another?
4. How do you find the absolute extrema of a function on a closed and bounded set?