Objectives for Exam #2

To be well-prepared for Exam #1, you should be able to

- understand and use equality of mixed partial derivatives (when relevant)
- read, with understanding, the various notations for partial derivatives
- state and use an appropriate interpretation (rate of change or slope) of the partial derivatives of a function of several variables
- use an appropriate chain rule to compute or express derivatives for a given composition of functions
- understand and draw relevant pictures for geometric views of vector, magnitude, direction, addition of vectors, scaling of a vector
- compute with component expressions for given vectors
- state and use a geometric expression for dot product
- state and use a component expression for dot product
- use algebraic properties of adding vectors, scaling vectors, and dot product of vectors to simplify vector expressions
- use the dot product to compute the angle between two given vectors
- compute the component or projection of a given vector in the direction of a second given vector
- use vectors to find coordinates of geometrically defined points
- use vectors to prove simple geometric facts
- understand the connections among the various forms for the equation of a plane, including the point-normal form
- determine the equation of a plane given appropriate information
- plot a curve traced out by a vector-valued function
- compute the derivative of a vector-valued function and understand how a derivative vector is related geometrically to the curve traced out by the function
- use vector-valued functions to describe position, velocity, and acceleration for an object moving in two or three dimensions
- compute infinitesimal displacement vectors along a curve
- use infinitesimal displacement vectors to compute the length of a curve
- understand the structure of level curves/surfaces in a zoomed-in view at a point
- articulate how gradient vectors are related to level curves/surfaces and greatest rate of change
- compute a gradient vector field for a given function (in cartesian coordinates)
- compute a directional derivative given a function, an input, and a direction
- state and use an appropriate interpretation (rate of change or slope) of a directional derivative
- determine the equation of a tangent plane at a given point for a given function of two variables
- determine the linearization based at a given point for a given function of two or more variables
- use a linearization to approximate outputs of a function for inputs near a given input
- determine an upper bound on the error in using a linearization as approximation for a function when given the formula
- compute and use a linear relation among differentials given a relation among two or more variables
- determine how percentage changes are related for two or more variables with a given relationship
- state and understand definitions related to local and global extremes
- find all possible local minimizers and local maximizers for a given function on a given domain