Review topics for Math 200, midterm 1.

This is a rough list of the things you should definitely be able to do. I think the best way to use this review sheet is to try to recall or come up with an example for each concept or technique listed below. Then try to solve that example, and if you cannot (or could not come up with one to begin with), then re-read the corresponding section in the book. It is very important to try to think of all these concepts without opening the book, at first. Copies of this review sheet will not be allowed at the exam. Good luck!

1. Vectors, and equations of lines and planes

- Two ways to write a vector: $\langle a, b, c\rangle = a\mathbf{i} + b\mathbf{j} + c\mathbf{k}$.
- Basic operations with vectors: addition, subtraction, scalar multiplication.
- Finding a unit vector parallel to a given vector $\mathbf{a}$: $\mathbf{u} = \frac{\mathbf{a}}{|\mathbf{a}|}$.
- Dot product and cross product of vectors.
- a component of $\mathbf{a}$ along $\mathbf{b}$. Vector projection of $\mathbf{a}$ onto $\mathbf{b}$.
- scalar triple product of vectors.
- parametric and symmetric forms of the equation of a line in space (how to write an equation of the line that contains two given points). How to determine whether two lines in space intersect.
- Equations of planes: normal vector; how to write an equation of the plane through three given points.
- Finding distances: between two points, from a point to a plane, from a point to a line.
- How to find symmetric and parametric equations for the line of intersection of two planes.

2. Quadric surfaces and cylinders

- You need to know the basic types of quadric surfaces and be able to sketch their main features.
- Given a quadric surface, need to be able to sketch its traces in the horizontal and vertical planes.

3. Functions of two (or three) variables

- Domain and range. Contour maps.
- Partial derivatives.
- Differential equations: need to be able to check whether a given function satisfies a given differential equation.