Winter 2012   Math 224   Topics for the final

Chapter 12 Functions of several variables Know how to:

- make connections between formulas defining functions of two variables and their graphs and contour diagrams,
- recognize the domain and the range of a function,
- recognize a linear function based on its contour diagram,
- find an equation of a plane based on limited information, for example a point and a line in the plane,
- recognize surfaces in the catalog on page 636 and use these to identify level surface for a function of three variables.

Chapter 13 Vectors Know how to

- do algebra with vectors,
- use both definitions of the dot product to find angles between vectors, recognize and find orthogonal vectors, resolve vectors into components, calculate projections,
- find the equation of the plane with the given normal vector and passing through a given point,
- use both definitions of the cross product to find angles between vectors and areas related to two vectors,
- use the cross product to find an equation of a plane through three given points.

Chapter 14 Differentiating functions of several variables Know how to

- visualize a partial derivative on a contour diagram,
- estimate partial derivatives using difference quotients,
- find the units for and interpret partial derivatives, (What partial derivatives mean in practical terms?)
- find a tangent plane to the graph of $f(x, y)$ and find the tangent plane to a level surface of a function of three variables,
- find a local linearization of a function with two or three variables,
- find the differential of a function of two or three variables and use it to estimate the change of the function (see Problem 30 page 742),
- calculate the gradient of a function of two and three variables and how to interpret it and how to use it for various tasks,
- ■ find directional derivatives of functions of two and three variables,
- calculate second-order partial derivatives and how to interpret them,
- read information about second-derivatives from a contour diagram and graph of a function of two variables.

Chapter 15 Optimization Know how to

- find and classify critical points of functions of two variables,
- find local and find global extrema,
- ■ apply the above topics to the optimal design of different types of boxes and other geometric problems,
- ■ solve various problems involving Lagrange multipliers,
- interpret the meaning of λ.

Chapter 16 Integration Know how to

- calculate double integrals (using rectangular or polar coordinates) for reasonable regions R and functions $f(x, y)$,
- estimate double integrals based on contour diagrams of functions of two variables,
- calculate triple integrals (using rectangular or cylindrical or spherical coordinates) for reasonable regions W and functions $f(x, y, z)$,
- ■ use double integrals and triple integrals to find volumes, masses, and averages.

The symbol ■ denotes a topic that will definitely appear on the exam.