

## Review Sheet for second exam

Math 2210–3, March 31, 2010

Our second exam is on Wednesday April 7, in class, from 10:40–11:45. The exam will cover all of chapters 12–13. Of course we are building on the material from earlier in the course, so you'll be expected to be comfortable with vector algebra, geometry, and curves, from chapter 11. In the outline below you are responsible for each topic! We will go through this sheet on Monday April 1.

### Differentiability for functions of several variables (Chapter 12)

- functions of two or three variables (12.1)

- the graph  $z=f(x,y)$ . Contours on the graph.

- level curves of  $f(x,y)$ , in the domain

- level surfaces of the function  $f(x,y,z)$ , in the domain

- partial derivatives (12.2)

- definition

- meaning in terms of rate of change of function in coordinate directions.

- how to compute partial derivatives

- interpretation of partial derivatives as slope of trace curve, for functions of two variables.

- higher order partial derivatives; equality of mixed partials.

- limits and continuity (12.3)

- definitions, meaning.

- differentiability (12.4–12.7)

- definition and meaning:

- which functions are differentiable?

- tangent approximation function, tangent plane

- differential approximation (12.7)

- directional derivatives (12.5)

- definition and meaning

- how to compute with the gradient

- relation of gradient to level curves and level surfaces – tangent planes revisited

- chain rule! (12.6)

- Max–min problems (12.8–12.9)

- Continuous functions on closed and bounded sets attain their extrema – where?

- Critical points in the interior – how to find them?

- Second derivative test

- Lagrange method for constrained optimization problems (12.9)

### Multiple Integration (Chapter 13)

- double integrals over rectangular domains

- definition and meaning, properties (13.1)

- how to compute as iterated integrals (13.2)

- double integrals over non–rectangular domains (13.3–13.4)

- iterated integrals for vertically or horizontally simple domains (13.3)

- how to change order of integration in iterated integrals (13.3)

- double integrals in polar coordinates (13.4)

- applications of double integrals (13.3, 13.5, 13.6)

- volumes, mass, center of mass, moments of inertia, surface area of graphs

- triple integrals and applications

- in cartesian coordinates (13.7)

- in spherical or cylindrical coordinates (13.8)

- general change of variables in multiple integrals (13.9)