Math 208H A checklist of topics covered

Final exam Wednesday May 2, 10:00am - 12:00noon, Oldfather 208

Vectors

vectors are arrows! coordinate notation and $\vec{i}, \vec{j}, \vec{k}$ notation
vector sum, length, dot product, cross product; orthogonal vectors
projection of one vector onto another
area via cross product; volume via triple product
equation of the line through two points; line via direction and starting position
equation of the plane passing through three points
equation of a plane from a point and normal vector.

Functions of several variables; differentiation

domain, graph; sketch cross-sections, sketch contour diagrams/level curves.
partial derivatives, gradient, directional derivative
linear approximations, differentials; differentiability
Chain Rule for several variables
higher order partial derivatives; mixed partials are equal
equation for tangent plane to the graph
directional derivatives and the gradient
gradient vectors are perpendicular to level curves; direction of greatest increase
critical points; local max's/min's/saddle points via the discriminant $f_{xx}f_{yy} - (f_{xy})^2$
global max or min over a domain (unconstrained optimization)
optimization subject to a constraint - Lagrange multipliers

Integration

integrals are *sums* (but don't compute this way!)
integral of a function of two variables over a region in the plane
iterated integrals; reversing the order of integration
applications: area, average value
change of variables formula; Jacobian; double integrals in polar coordinates
triple integral over a region R in 3-space
iterated integrals; "shadow" of R in the plane
change of variables; cylindrical and spherical coordinates.

Vector calculus

vector fields are a choice of vector at each point of a domain
sketch vector fields, e.g., gradient vector fields.
line integrals/path integrals; computations using a parametrization of a curve
the Fundamental Theorem of Line Integrals: integrating gradient fields
conservative vector fields; computing potential functions
curl of a vector field; Green's Theorem
compute the area of a region via Green's Theorem

Surface integrals

parametrized surfaces in 3-space; surface area
surface integrals/flux integrals
computations using a parametrization of a surface
special cases: graph of a function, cylinder, sphere
curl of a vector field; Stokes' Theorem
divergence of a vector field; the Divergence Theorem
volume of a region via the Divergence Theorem