Multivariable Calculus

Lecture Notes

The notes below represent summaries of the lectures as written by Professor Auroux to the recitation instructors.

I. Vectors and matrices		
0 1 2	Vectors Dot product Determinants; cross product	Week 1 summary (PDF)
3 4 5	Matrices; inverse matrices Square systems; equations of planes Parametric equations for lines and curves	Week 2 summary (PDF)
6	Velocity, acceleration Kepler’s second law	Week 3 summary (PDF)
7	Review	
II. Partial derivatives		
8	Level curves; partial derivatives; tangent plane approximation	
9	Max-min problems; least squares	Week 4 summary (PDF)
10	Second derivative test; boundaries and infinity	
11	Differentials; chain rule	
12	Gradient; directional derivative; tangent plane	Week 5 summary (PDF)
13	Lagrange multipliers	
14	Non-independent variables	Week 6 summary (PDF)
15	Partial differential equations; review	
III. Double integrals and line integrals in the plane		
16	Double integrals	Week 7 summary (PDF)
17	Double integrals in polar coordinates; applications	
18	Change of variables	
19	Vector fields and line integrals in the plane	Week 8 summary (PDF)
20	Path independence and conservative fields	
21	Gradient fields and potential functions	
22	Green’s theorem	Week 9 summary (PDF)
23	Flux; normal form of Green’s theorem	
24	Simply connected regions; review	Week 10 summary (PDF)
IV. Triple integrals and surface integrals in 3-space		
25	Triple integrals in rectangular and cylindrical coordinates	Week 10 summary (PDF)

26	Spherical coordinates; surface area	
27	Vector fields in 3D; surface integrals and flux	Week 11 summary (PDF)
28	Divergence theorem	
29	Divergence theorem (cont.): applications and proof	Week 12 summary (PDF)
30	Line integrals in space, curl, exactness and potentials	
31	Stokes' theorem	Week 13 summary (PDF)
32	Stokes' theorem (cont.); review	
33	Topological considerations Maxwell's equations	
34	Final review	Week 14 summary (PDF)
35	Final review (cont.)	