

620–231 Vector Analysis

References to Textbooks

This table gives references to the relevant section(s) of the text books **Vector Calculus, 4th edition** by Marsden and Tromba (labelled Marsden) and **Calculus of Several Variables, 4th edition** by Adams (labelled Adams) and to corresponding questions on the problem sheets.

Topic	Marsden	Adams	Questions
Functions of Several Variables			
Limits and continuity	§2.2	§3.2	1-4
Partial differentiation revision	§2.3, §3.1	§3.3, §3.4	5-6
Differentiability	§2.3	§3.6	7-9
Matrix version of chain rule	§2.5	§3.6	10-11
Jacobian	pg 359	§3.8	12-13
Taylor polynomials	§3.2	§3.9	14
Extrema, constrained extrema	§3.3	§4.1, §4.2	15
Lagrange multipliers	§3.4	§4.3	16-18
Space Curves and Vector Fields			
Vectors revision	§1.1, §1.2, §1.3	§1.2, §1.3	19-21
Parametric paths - velocity, acceleration	§2.4, §4.1	§2.1	22-25
Arc length	§4.2	§2.3	26
Tangent vectors, curvature, torsion	pg 263-264	§2.4, §2.5	27-29
Vector fields	§4.3	§6.1	30
Flow lines	§4.3	§6.1	31-32
Differential operators	§4.4	§7.1	33-36, 39-43
Basic identities of vector analysis	§4.4	§7.2	39-43
Scalar potentials	pg 497-500	§7.2	37-38
Double and Triple Integrals			
Double integrals	§5.1, §5.2, §5.3	§5.1, §5.2	45-49
Areas and volumes using double integrals	§5.3	§5.2	46
Change of order of integration	§5.4	§5.2	48-49
Sketching surfaces revision	§2.1	§1.5, §3.1	51-52
Triple integrals	§5.6	§5.5	50
Elementary regions	§5.6	§5.5	53
Volumes using triple integrals	§5.6	§5.6	54, 61
Polar, cylindrical and spherical coordinates	§1.4	§5.4, §5.6	55-57
Change of variables for multiple integrals	§6.2	§5.4, §5.6	58-63
Averages, centre of mass, moment of inertia	§6.3	§5.7	62-63

Topic	Marsden	Adams	Questions
Integrals over Paths and Surfaces			
Path integrals	§7.1	§6.3	65-66
Line integrals	§7.2	§6.4	67-69
Parametrization of paths and surfaces	§7.3	§6.4, §6.5	64, 70
Tangent planes to parametrized surfaces	§7.3	§6.5	71-72
Area of a surface	§7.4	§6.5	73
Integrals of scalar functions over surfaces	§7.5	§6.5	74-75
Integrals of vector functions over surfaces	§7.6	§6.6	76-77
Integral Theorems			
Green's theorem	§8.1	§7.3	78-81
Divergence theorem in plane	§8.1	§7.3	82-83
Stokes' theorem	§8.2	§7.5	84-86
Conservative fields	§8.3	§6.2	87-88
Gauss' divergence theorem	§8.4	§7.4	89-91
Mixed integral theorems	§8.1-§8.4	§7.3-§7.5	92-93
General Curvilinear Coordinates			
Orthogonal curvilinear coordinates	None	§7.7	94-97
Differential operators	None	§7.7	94-97