

BACKGROUND MATERIAL — III

This document contains further information on background material from multivariable calculus with cross-references to the current text.

MULTIVARIABLE CALCULUS

Vector Calculus (Third Edition), by S. J. Colley. Prentice-Hall, 2006.

Partial differentiation

(§§ 2.1–2.3, 2.5–2.6)

Graphs of level surfaces, partial derivatives and continuity, differentiability, the derivative matrix and tangent planes, the chain rule, gradients and partial derivatives, implicit differentiation.

Higher derivatives and extrema

(§§ 2.4 omitting Newton's Method, 4.1–4.4)

Higher order partial derivatives, Taylor's Theorem, maxima and minima, second derivative test, constrained extrema and Lagrange multipliers.

Vector valued functions

(§§ 3.1–3.4, omitting Kepler's Laws in § 3.1)

Acceleration, arc length, vector fields, divergence and curl.

Multiple integration

(§§ 5.1–5.6)

Computation of volumes, double integrals over rectangles and more general regions, triple integrals, changes of variables to polar, cylindrical and spherical coordinates, elementary physical applications of multiple integrals.

Integrals over curves and surfaces

(§§ 6.1–6.3, 7.1–7.2)

Line integrals, parametrized surfaces, surface area, surface integrals, flux of a vector field.

Integral theorems of vector analysis

(§§ 7.3–7.4)

Theorems of Green, Stokes and Gauss; path independence of line integrals and the Fundamental Theorem of Calculus. Applications to deriving physical laws.