

# Differential Geometry; Chapter III

## Study Guide

The following is a *brief* list of topics covered in Chapter III, “Dual Spaces,” of Dodson and Poston’s *Tensor Geometry*, 2nd edition. This list is not meant to be comprehensive, but only gives a list of several important topics.

### III.1. Contours, Covariance, Contravariance, Dual Basis.

Set of all linear maps between vector spaces  $X$  and  $Y$   $L(X, Y)$ , linear functionals, dual vectors/covariant vectors, contravariant vectors, dual space  $X^*$ , dual map,  $\dim(X^*) = \dim(X)$  (Lemma III.1.04), dual basis, Einstein summation convention,  $[\mathbf{A}^*]_{\beta'}^{\beta} = \left([\mathbf{A}]_{\beta}^{\beta'}\right)^t$  (Theorem III.1.A), change of bases (Theorem III.1.B), the natural isomorphism between  $(X^*)^*$  and  $X$  (Note III.1.B).