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An Introduction to Geometric Algebra: From Basic Manipulations to Coordinate Frames

Abstract: We will first look at the basic operations and properties of GA, and then address in more detail a few important GA concepts –which will be used in subsequent lectures. These include rotating via rotors, the idea of a reciprocal frame and the vector derivative/gradient operator in GA, showing how this combines the algebraic properties of a vector with the operator properties of partial derivatives. It is often convenient to work in a curvilinear coordinate system (e.g. spherical polars) where the frame vectors vary –we will investigate how we deal with curvilinear coordinates in GA and in particular how we can easily recover the standard conventional forms of div, grad and curl, for a few common coordinate systems.