

## 11.4: Landau's Proof Using the Jacobian

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Landau gives a very elegant proof of elemental volume invariance under a general canonical transformation, proving the Jacobian multiplicative factor is always unity, by clever use of the generating function of the canonical transformation.

Jacobians have wide applicability in different areas of physics, so this is a good time to review their basic properties, which we do below, as a preliminary to giving the proof.

It must be admitted that there are simpler ways of deriving Liouville's theorem, directly from Hamilton's equations, *the reader may prefer to skip the Jacobian proof at first reading.*

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