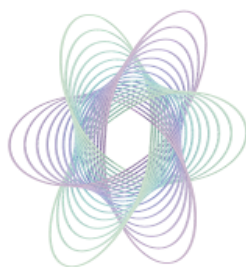


# The symplectic approach to canonical transformations

Exploration of the symmetry between the canonical  $q$  and  $p$  in the Hamilton formalism.



## 1 Problem

In the symplectic notation, Hamilton's equations can be grouped together and written on a compact form. This is shown at the end of section 8.1 in Goldstein. This notation is applied to canonical transformations in section 9.4. In particular, many of the time-independent transformations can be characterized by a matrix. The structure of this *symplectic matrix* gives a necessary and sufficient condition for whether the transformation is canonical or not.

The report should explain the general idea of this approach, and how it is different from the approach considered during the lectures. It should be clear what the *symplectic condition for canonical transformations* is and how it comes about.

## **References**

- [1] Goldstein, *Classical Mechanics*, pages 342-343, and section 9.4.