

Assignment 4

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Under the infinitesimal transformation, x^i and p^i change as:

$$\tilde{x}^i = x^i + \epsilon \frac{\partial g(\bar{x}, \bar{p})}{\partial p^i}$$

$$\tilde{p}^i = p^i - \epsilon \frac{\partial g(\bar{x}, \bar{p})}{\partial x^i}$$

Taking $g(\bar{x}, \bar{p})$ to be $H(\bar{x}, \bar{p})$, and from the equations of motion

$$\dot{p}^i = -\frac{\partial H(\bar{x}, \bar{p})}{\partial x^i}$$

$$\dot{x}^i = \frac{\partial H(\bar{x}, \bar{p})}{\partial p^i}$$

the transformed co-ordinates are:

$$\tilde{x}^i = x^i + \epsilon \dot{x}^i = x^i(t + \epsilon)$$

$$\tilde{p}^i = p^i - \epsilon (-\dot{p}^i) = p^i + \epsilon \dot{p}^i = p^i(t + \epsilon)$$

Hence, this transformation corresponds to a translation in time.