Lecture 27: Canonical Transformations

Monday, March 30, 2020

«missed the first part of the lecture»

Consider a generating functional which is now a function of q and P: $F(q, P)$. We want to choose F such that $H' = 0$. If this is true,

$$\begin{aligned} p\dot{q} - H = P\dot{Q} - H + \frac{\mathrm{d}F}{\mathrm{d}t} &= -\dot{P}Q - H' + \frac{\mathrm{d}F}{\mathrm{d}t} \\ &= -\dot{P}Q - H' + \frac{\partial F}{\partial t} + \frac{\partial F}{\partial q}\dot{q} + \frac{\partial F}{\partial P}\dot{P} \end{aligned}$$

so we get that

$$Q = \frac{\partial F}{\partial P} \qquad p = \frac{\partial F}{\partial q}$$

and

$$-H = -H' + \frac{\partial F}{\partial t}$$