

```
In[14]:= (* Hamilton's equation of motion *)
Heqns[H_, p_, q_, t_] := {Simplify[ $\partial_q H == -\partial_t p$ ], Simplify[ $\partial_p H == \partial_t q$ ]}
```

```
(* 1. Simple pendulum *)
H = P $\theta[t]^2 / (2 m l^2) - m g l \cos[\theta[t]]$ ;
Heqns[H, P $\theta[t]$ ,  $\theta[t]$ , t]
```

```
Out[16]=  $\left\{ g l m \sin[\theta[t]] + P\theta'[t] == 0, \frac{P\theta[t]}{l^2 m} == \theta'[t] \right\}$ 
```

```
In[17]:= (* 2. Genaralized Pendulum *)
H = a P $\theta[t]^2 + b \cos[\theta[t]]$ ;
Heqns[H, P $\theta[t]$ ,  $\theta[t]$ , t]
```

```
Out[18]=  $\{ b \sin[\theta[t]] == P\theta'[t], 2 a P\theta[t] == \theta'[t] \}$ 
```