Homework 7 Corrections

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Problem 1

a.

$Y = -p/mg$, need to track my signs better. Especially when taking derivatives.

b.

Both the

$$\dot{Y} = \frac{\partial K}{\partial P}$$

and

$$\dot{P} = -\frac{\partial K}{\partial \dot{Y}}$$

need to be taken.

$$\dot{Y} = 1, \dot{P} = 0.$$

Integrating these equations for Y(t) and P(t) we get,

$$Y(t) = t + C, P(t) = E.$$

c.

Going back to part a and combining with part b we have

$$Y = -\frac{p}{mg} \rightarrow -mgY(t) \rightarrow -mg(t + C)$$

Initial conditions show that t = 0 so

$$p(0) = -v_0/g$$

and

$$Y(0) = -v_0^= h$$

Finally,

$$E = \frac{mv_0}{2} + mgh$$

d.

Lastly we need to find another canonical transformation given the generating function. Where the generating function is

$$F_4 = \frac{p^3}{6m^2 g} - p\frac{R}{mg} - Rt$$

We find that

$$H = \frac{p^2}{2m} + mgy = R$$

and

$$Z = -\frac{p}{mg} - t.$$

know H and $\partial F_4/\partial t$

$$K = 0$$

$Z(t)$ and $R(t)$ can be found by

$$\dot{Z} = 0 \rightarrow Z(t) = A$$

$$\dot{R} = 0 \rightarrow = B.$$

The initial conditions where t = 0 yield

$$R(0) = \frac{mv_0^2}{2} + mgh$$

and

$$Z(0) = -\frac{v_0}{g}.$$