Q18 / P-32 Reference = Goldstein

$$L = \frac{m}{2}(a\dot{x}^2 + 2b\dot{x}\dot{y} + c\dot{y}^2) - \frac{k}{2}(ax^2 + 2bxy + cy^2) \quad (1)$$

a, b, c are arbitrary constants with condition $b^2 - ac \neq 0$

Find eq. of motion?

Examine two cases, $a = 0 = c$

& $b = 0, c = -a$

what are the physical system described by above Lagrangian?

Q20 / P-33 A particle of mass m move in one dimension such that

$$L = \frac{m^2\dot{x}^4}{12} + m\ddot{x}^2 V(x) - V_2(x)$$

V is f of x. Find eq. of motion for x(t) and describe the physical nature of the system on the basis of this equation.

Q14 / P-364

$$L = a\dot{x}^2 + b\frac{\dot{y}}{x} + c\dot{x}\dot{y} + fy^2\dot{x}^2 + g\dot{y}^2 - k\sqrt{x^2+y^2}$$

where a, b, c, f, g & k are constants.

Find Hamiltonian?

what quantities are conserved?

Q15 / P-364

$$L = \dot{q}_1^2 + \frac{\dot{q}_2^2}{a+bq_1^2} + k_1 q_1^2 + k_2 \dot{q}_1 \dot{q}_2$$

a, b, k_1 & k_2 are constants.

Find equations of motion in the Hamiltonian formulation

Q16 / P-364

$$H = \frac{p^2}{2\alpha} - bq\,p e^{-\alpha t} + \frac{ba}{2} q^2 e^{-\alpha t}(\alpha + be^{-\alpha t}) + \frac{kq^2}{2}$$

a, b, α & k are constants.

→ Find Lagrangian

→ Find equivalent Lagrangian that is not explicitly dependent on time.

→ What is Hamiltonian corresponding to second Lagrangian

& what is the relationship b/w the two Hamiltonian