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Scattering Problems

Newton's Laws

benefits from the use of

Conservation Laws

Noether's Theorem

which finds deeper meaning in light of

Virial Theorem

Conservative Vector Field Equations

Derivation

which gives useful results including

Derivation

Center of Mass Motion

Derivation

Angular Momentum for Many Particles under Central Forces

Central Force Problems

often aided by writing the equation as

Taylor's u-Equation

which makes it much easier to solve the

Kepler Problem

Reduced Mass

determine the change in orbit due to an impulse

Conic Sections

and is particularly useful for studying the

which benefit from defining the

Derivation

Effective Potential

Arbitrary Potential Oscillation Period

find the period of oscillation for an arbitrary potential

Gauge Invariance

Derivation

EM Lagrangian

which exhibits

Convective Derivative Derivation

which involves the

Derivation

3

when combined with equations for the 4-potential, give the

Lagrangian Dynamics

Fermat's Principle

uses

centers around the

Euler-Lagrange Eq.'s

which allow us to

find the equations of motion

for which we can then

find stability or frequency of oscillations about equilibrium

find the equilibrium configuration

and analyze them to

show that the motion decouples for small oscillations

solve for trajectories exactly

which is based on

solve for ray paths in geometric optics

Calculus of Variations

which explains

Derivation

with the help of

Lagrange Multipliers

find the forces of constraint

which is relevant beyond dynamics to

solve the brachistochrone problem

Hamilton's Eq.'s

Invariance of the Lagrangian

which come from

Derivation

and in the case of

Nonholonomic Constraints

one can

find when an object loses contact with a surface

based on

which is the same condition as

Derivation

Generalized Momentum

Hamilton-Jacobi Eq.

Hamiltonian Dynamics

Invariance of the Hamiltonian

Accelerated Coordinate Systems

find deflection of falling objects on earth

General Fictitious Forces Eq.

Approximating Systems of ODEs as Perturbations

Poisson Bracket

Legendre Transformation

Hamilton's Principal Function

Condition of Canonicity

which relates to the theory of

5

Wikipedia Angular Momentum Equation

Euler Angles

calculate the angular velocity from description of the motion

Center of Percussion

Intermediate Axis Theorem

Parallel Axis Theorem

2

4

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Concepts and Definitions

Equations

Example Problems

Derivations