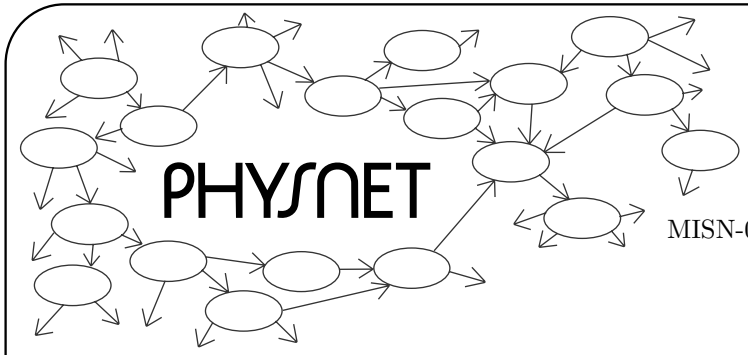

MISN-0-499

LAGRANGIAN MECHANICS

Classical Mechanics

Project PHYSNET Physics Bldg. Michigan State University East Lansing, MI

LAGRANGIAN MECHANICS

by

C. P. Frahm

Title: **Lagrangian Mechanics**

Author: C. P. Frahm, Physics Dept., Illinois State Univ

Version: 2/1/2000 Evaluation: Stage B0

Length: 2 hr; 7 pages

Input Skills:

1. Vocabulary: Lagrange's equations, Lagrangian, inertial frame (MISN-0-498).

Output Skills (Knowledge):

K1. Vocabulary: Hamiltonian.

K2. By considering the properties of space and time as seen from an inertial frame derive these conservation laws within the Lagrangian formulation of mechanics: (a) conservation of energy, (b) conservation of linear momentum, (c) conservation of angular momentum.

Output Skills (Problem Solving):

S1. For a given mechanical system determine the Lagrangian and Hamiltonian functions.

S2. Solve Lagrange's equations of motion to obtain expressions for the generalized coordinates as functions of time.

External Resources (Required):

1. J. Marion, *Classical Dynamics*, Academic Press (1988).

THIS IS A DEVELOPMENTAL-STAGE PUBLICATION
OF PROJECT PHYSNET

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Our publications are designed: (i) to be updated quickly in response to field tests and new scientific developments; (ii) to be used in both classroom and professional settings; (iii) to show the prerequisite dependencies existing among the various chunks of physics knowledge and skill, as a guide both to mental organization and to use of the materials; and (iv) to be adapted quickly to specific user needs ranging from single-skill instruction to complete custom textbooks.

New authors, reviewers and field testers are welcome.

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Views expressed in a module are those of the module author(s) and are not necessarily those of other project participants.

LAGRANGIAN MECHANICS

by

C. P. Frahm

1. Introduction

This is a continuation of Unit 498, now with an emphasis on conservation laws and problem solving.

2. Procedures

1. Read Sections 7.8 and 7.9 of Marion. You must be prepared to reproduce these arguments, including statements of the conditions under which they are valid.

2. ▷ Work problems 7-5, 7-6, 7-17, 7-18, 7-21, 7-24.

3. (Optional) ▷ Work problems 7-4, 7-19, 7-22.

Acknowledgments

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