

### Tutorial #6 – Dynamics of Circular Motion

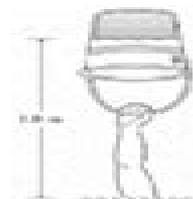
- (K4 Ex8.10mod)
  - What is the maximum speed (in km/h) with which a 1500 kg car can successfully take a highway exit ramp of radius 50 m on a level (unbanked) road in dry conditions without sliding? ( $\mu_s = 1.0$ )
  - How does the maximum speed from Part A. change if the roads are wet? ( $\mu_s = 0.3$ )
  - What is the correct banking angle if a car, traveling at 50 km/h, can take this curve without assistance from friction? (Hint: Use the trigonometric identity  $\tan \theta = \frac{\sin \theta}{\cos \theta}$ )
  - What direction (not magnitude!) is the friction force on a car if it takes the curve at a speed of 70 km/h?

- (K4 Ex8.13mod) Mass  $m_1 = 1.0 \text{ kg}$  on a frictionless table is connected by a string through a hole in the table to a hanging mass  $m_2 = 2.0 \text{ kg}$ . With what angular velocity must  $m_1$  rotate in a circle of radius  $r = 50 \text{ cm}$  if  $m_2$  is to remain hanging at rest?

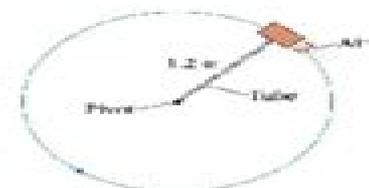


- (K4 Ex8.17) Communications satellites are placed in circular orbits where they stay directly over a fixed point on the equator as the earth rotates. These are called *geosynchronous orbits*. The altitude of a geosynchronous orbit is  $3.58 \times 10^7 \text{ m}$ .
  - What is the period of a satellite in a geosynchronous orbit? (Use common sense!)
  - Find the value of  $g$  at this altitude. (Full derivation required. Do not use Newton's law of universal gravitation.)
  - What is the weight of a 2000 kg satellite in a geosynchronous orbit?

- (K4 Ex8.22) A student has 65-cm-long arms. What is the minimum angular velocity (in rpm) for swinging a bucket of water in a vertical circle without spilling any? The distance from the handle to the bottom of the bucket is 35 cm. (Hint: This is similar to the minimum speed of a roller coaster.)



- (K4 P8.70) A 500 g steel block rotates on a steel table while attached to a 1.2-m-long hollow tube as shown. Compressed air fed through the tube and ejected from a nozzle on the back of the block exerts a thrust force of 4.0 N perpendicular to the tube. The maximum tension the tube can withstand without breaking is 50 N. If the block starts from rest, how many revolutions does it make before the tube breaks? ( $\mu_k = 0.60$ )



Answers: 1) a. 80 km/h, b. 44 km/h, c.  $21^\circ$ , d. Down the ramp. 2) 6.3 rad/s. 3) a. 86,400 s, b.  $0.223 \text{ m/s}^2$ , c. 0 N. 4) 30 rpm. 5) 3.8 rev.

# Challenge Problem Solutions Circular Motion Dynamics

**Daniel Milton Oman, Robert Milton  
Oman**



## **Challenge Problem Solutions Circular Motion Dynamics:**

The Key to Newton's Dynamics J. Bruce Brackenridge, 1995 The Key to Newton's Dynamics is lucid important and fills a large gap in the existing literature Brackenridge is undoubtedly that gifted patient teacher that one expects from a quality liberal arts college Alan E Shapiro University of Minnesota

**Core Concepts of Mechanics and Thermodynamics**  
Rituraj Dalal, 2025-02-20 Core Concepts of Mechanics and Thermodynamics is a textbook designed for students and anyone interested in these crucial areas of physics The book begins with the basics of mechanics covering motion forces and energy and then moves on to thermodynamics discussing heat temperature and the laws of thermodynamics The book emphasizes clear explanations and real world examples to illustrate concepts and it also provides problem solving techniques to apply what you learn It covers mechanics and thermodynamics from basic principles to advanced topics explains concepts clearly with examples teaches problem solving techniques connects theory to real world applications in engineering physics and materials science and includes historical context to show the development of these ideas Core Concepts of Mechanics and Thermodynamics is a valuable resource for students teachers and self learners Whether you are beginning your journey or seeking to deepen your understanding this book provides a solid foundation in these essential subjects

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*How to Solve Physics Problems* Daniel Milton Oman, Robert Milton Oman, 2016-01-01 Publisher's Note Products purchased from Third Party sellers are not guaranteed by the publisher for quality authenticity or access to any online entitlements included with the product Learn how to solve physics problems the right way How to Solve Physics Problems will prepare you for physics exams by focusing on problem solving You will learn to solve physics problems naturally and systematically and in a way that will stick with you Not only will it help you with your homework it will give you a clear idea of what you can expect to encounter on exams 400 physics problems thoroughly illustrated and explained Math review for the right start New chapters on quantum physics atoms

molecules and solids and nuclear physics      **Physics in India, Challenges and Opportunities**, 1970 Papers and proceedings      **How To Solve Physics Problems** Robert M. Oman, Daniel M. Oman, 1997 This is a comprehensive presentation of the fundamental core concepts in physics It provides fewer problems than an outline but goes into greater depth and explanations in the solution      Planetary Astronomy from the Renaissance to the Rise of Astrophysics, Part A, Tycho Brahe to Newton R. Taton, C. Wilson, Michael Hoskin, 2003-09-18 The International Astronomical Union and the International Union for the History and Philosophy of Science have sponsored a major work on the history of astronomy which the Press publishes are in four volumes three of which will be divided into two parts Publication commenced with volume 4 part A The history of astronomy has never been tackled on this scale and depth and this major synthesis breaks wholly new ground The individual chapters of each volume have been prepared by leading experts in every field of the history of astronomy      **Acta Physica Hungarica**, 1977      *Acta Physica Academiae Scientiarum Hungaricae*, 1977

*New Trends in Astrodynamics and Applications* Edward Belbruno, 2005      Special Issue, Current and Future Challenges in the Applications of Mathematics, 1998      **Physics for Scientists and Engineers** Douglas C. Giancoli, 1988 For the calculus based General Physics course primarily taken by engineers and science majors including physics majors This long awaited and extensive revision maintains Giancoli's reputation for creating carefully crafted highly accurate and precise physics texts Physics for Scientists and Engineers combines outstanding pedagogy with a clear and direct narrative and applications that draw the student into the physics The new edition also features an unrivaled suite of media and on line resources that enhance the understanding of physics      Journal of Guidance, Control, and Dynamics, 2009      **Pope John Paul II and the Challenges of Papal Diplomacy** Pope John Paul II, André Dupuy, 2004      *Astrodynamics, Space Missions, and Chaos* Edward Belbruno, David Folta, Pini Gurfil, 2004 The subject of astrodynamics is of particular interest at this critical juncture for space projects in the wake of the Columbia disaster This volume based on a conference sponsored by NASA and Princeton University comprises papers on the applications of chaos and dynamical systems including considerations of asteroid pairs near Earth objects and asteroidal dust formation flying optimization guidance and control systems mission design orbit dynamics and propulsion including material on NASA's major initiative Project Prometheus The volume is also of value to mathematicians for its discussion of chaos related issues to astronomers astrodynamists and planetary geologists for its blueprint for the methodology of future space exploration and to engineers for its discussion of innovations in space propulsion systems It is also a must read for commercial economic and military policymakers      Proceedings of the 5th Joint ASME/JSME Fluids Engineering [Division] Summer Conference--2007: (parts A and B) Symposia American Society of Mechanical Engineers. Fluids Engineering Division, American Society of Mechanical Engineers. Fluids Engineering Division. Summer Meeting, 2007      **University Physics** Hugh D. Young, Roger A. Freedman, 2000 This work aims to enable students to develop physical intuition and strong problem solving skills In addition it points out the conceptual and computational

pitfalls that commonly plague beginner physics students      *Moving Beyond Icebreakers* Stanley Pollack, Mary Fusoni, 2005  
Moving Beyond Icebreakers contains 440 pages packed with insight and ideas about building community engaging students in learning and making meetings work It describes an innovative meeting format and documents over 300 interactive exercises not just icebreakers that enable readers to Achieve group goals Build relationships Resolve group problems Teach lead motivate and inspire The first 130 pages describe how to use icebreakers and other interactive methods to help group members make decisions create new ideas solve problems resolve conflicts and understand new concepts In these pages you will find a five part meeting structure that you can use to become an expert facilitator following an approach that engages both youth and adults in meeting the group s goals You will also find detailed agendas lesson plans and scenarios that show how this approach works in the real world Table of contents Why use interactive methods Working into interaction Coping with resistance and fear of failure The interactive meeting format Interactive exercises name exercises warm up questions five minute springboard exercises fifteen minute springboard exercises in your chair springboard exercises tag style springboard exercises springboard exercises for groups both large and small the rest of the springboard exercises work station exercises evaluation exercises      [The Vortex Theory of Planetary Motions](#) E. J. Aiton, 1972      *College of Engineering (University of Michigan) Publications* University of Michigan. College of Engineering, 1989 Also contains brochures directories manuals and programs from various College of Engineering student organizations such as the Society of Women Engineers and Tau Beta Pi

## Unveiling the Magic of Words: A Review of "**Challenge Problem Solutions Circular Motion Dynamics**"

In a world defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their ability to kindle emotions, provoke contemplation, and ignite transformative change is truly awe-inspiring. Enter the realm of "**Challenge Problem Solutions Circular Motion Dynamics**," a mesmerizing literary masterpiece penned with a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve into the book's central themes, examine its distinctive writing style, and assess its profound effect on the souls of its readers.

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