PHY138Y - Review for Test 1

Our approach has many times spiraled through the material.

Today we will put many pieces together.

Therefore, this review will not always be in the order in which we did things in class.

Reminders:

- You must bring:
 - Your student card
 - A dark-black soft-lead pencil
- The test is closed book
- You may bring:
 - 8 ½ x 11 inch sheet of paper on which you have written anything that you wish
 - A non-programmable calculator without text storage or communication abilities
- · By design the test is "hard"

Format

- 8 Multiple Choice Questions
 - Correct answers get 8 marks
 - Incorrect answers get 0 marks
 - Non-answered questions get 0 marks
 - Multiple answers get 0 marks
- 1 Long Answer Question with 6 Parts (36 marks total)
 - Some partial credit given
 - Be sure to show your work

"Examsmanship"

- · Answer the question you are asked
 - Some students insist on answering questions that are not being asked
- · Multiple-Choice
 - Are some answers obviously wrong?
- Being calm and confident will allow you to do your best
- The "last minute cram" makes it much harder to be calm and confident
 - The cram is *proven* not to work in physics

Assumptions of Classical Physics

- The world is mechanistic, a "clockwork"
- The world is continuous
- The world is describable by mathematical Laws
- The description includes:
- Everyday words with precise defns
- Operational Definitions

Problem Solving

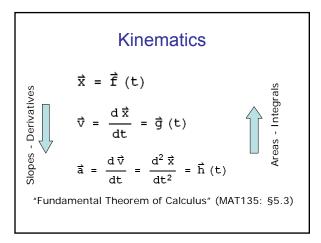
- Model
- Visualise
 - Pictorial, physical & graphical
- Guess the answer
- Solve
 - · If numeric, put in numbers last
- Assess

Visualisation

- Choose coordinate system
 - "Reference Frame"
 - In principle arbitrary
- Define the system and the environment
- Graphs
- Motion Diagrams
- Free Body Diagrams
- Momentum Bar Charts
- Energy Diagrams

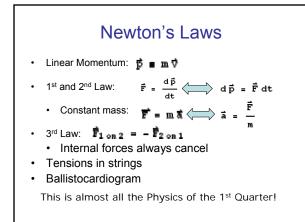
Where is the object?

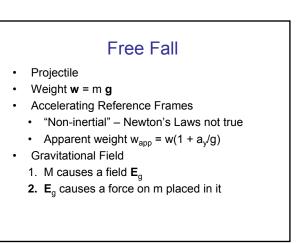
- Displacement (vector) vs. Distance (scalar)
- Position vector [±]/₂
- If the object moves:

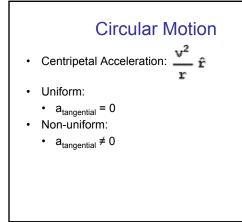


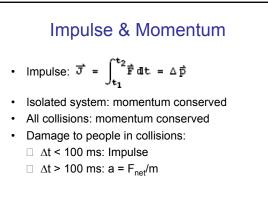


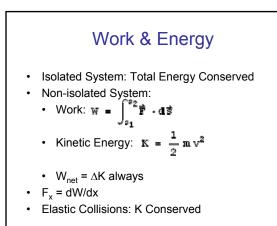
- Constant
- Free fall
- Non-constant
- Uniform Circular Motion
- Non-uniform Circular Motion
- Spring-mass

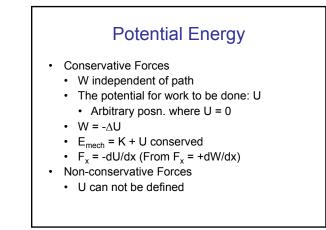












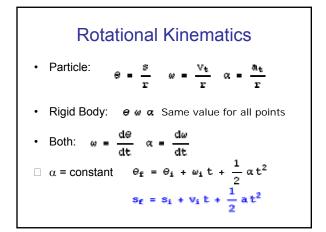
Power

- $P = dE_{sys}/dt$
 - Basal ("Resting") Metabolic Rate
 - Resting person: 60 90 Watts
 - Different organisms, mass m:
 - Dimensional analysis: bmr ~ m^{2/3}
 - Data: bmr ~ m^{3/4}
 - Fractal?

Centre of Mass (cm)

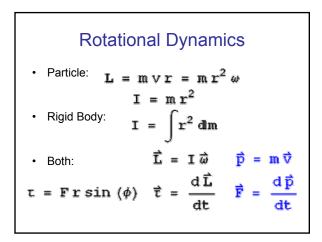
 Isolated Rigid Body: rotates about its centre of mass

$$\vec{\mathbf{r}}_{cm} = \frac{1}{M} \int \vec{\mathbf{r}} \, \mathrm{d}\mathbf{m}$$



Signs and Vectors for Rotational Quantities

- Counter-clockwise rotations: positive
- Clockwise rotations: negative
- Angular velocity vector:
 - Lies along axis of rotation
 - "Right hand screw" rule determines the direction.



Work – Energy Redux • Work: w = िर वी∂ w = िर वीऽ
$W_{net} = \Delta K_{tot}$
• Kinetic Energy: $K_{tot} = K_{trans} + K_{rot}$ $K_{rot} = \frac{1}{2} I \omega^2$ $K_{trans} = \frac{1}{2} m V_{cm}^2$
 Potential Energy: U_g = mgy_{cm}