Review for Exam 2

Physics 211
Syracuse University, Physics 211 Spring 2022
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Announcements

Help hours today: I'll be in the Physics Clinic 10:00-10:45 and 4-6.

Other people will be there to assist you during the rest of the day.

Group Exam 2

Your second group exam is Wednesday.

I know it is a short turnaround before the exam on Thursday.

So, I will be posting full solutions during the day, as soon as each group finishes their exam.

That way, as soon as the last group finishes, you'll have the full solutions.

Exam 2

This exam will be just like Exam 1. A few reminders:

- You may bring a page of notes
- You may bring a calculator (not one that does algebra)
- There will be assigned seats (different than before)
- Taking your exam at CDR? They'll have a copy for you.
- Need other accommodations? Let me know.

What will be on it? **Relating the forces on objects to their motion with $\vec{F} = m\vec{a}$:**

- Drawing force diagrams
- Dealing with inclines
- Dealing with multiple objects
- Dealing with unknown tension/normal forces
- Dealing with friction
- Dealing with circular motion
- Interpreting things like "why doesn't the frog fall out of the bucket?"

Drawing force diagrams:

- Each object gets its own force diagram
- Only forces acting *directly on that object* go on the diagram
- Let physics take care of indirect things for you (three book problem)
- Forces are real tangible things (plus gravity)
- Label each force with the symbol you'll use for it in algebra
- Draw your diagrams **large** – you may need to do trig, etc.

Dealing with inclines:

- Tilt your coordinate system so it aligns with the (possible) acceleration
- a_y will generally be zero
- You'll need to decompose the weight force into components

Dealing with multiple objects:

- Each object gets its own force diagram
- Only draw the forces acting on each object on its diagram
- Different objects may have different $\vec{a}$:
  - Use $a_{1,x}$, $a_{2,y}$, etc. – then think how they relate
  - You'll have multiple equations – that's okay

Dealing with unknown tension/normal forces:

- Just because they're unknown doesn't make them scary
- Normal forces are however big they need to be to stop two objects from moving through one another
- Tension is however big it needs to be to keep ropes from stretching
- Leave F_N or T as unknowns in your system of equations – you'll solve for them

Dealing with inclines:

- Tilt your coordinate system so it aligns with the (possible) acceleration
- a_y will generally be zero
- You'll need to decompose the weight force into components

Dealing with friction:

- Friction opposes the relative motion of two things
- For passive objects this is simple
- "Traction" – static friction between propelled vehicle/person/animal and ground
  - It points whatever direction the driver wants it to
- Friction requires you to deal with two dimensions – first find F_N, then substitute into $F_{\text{fric}} = \mu F_N$

Dealing with circular motion:

- If an object is going in a circle, that just tells you its acceleration
- $a = \omega^2 r$ or v^2/r toward the center
- Use the first one if you know/care about ω and the second if you know/care about v
- Do not overcomplicate this!

Interpreting motion in an accelerating frame:

- Newton's laws are *not valid* in an accelerating "box"
  - Accelerating/turning car
  - A room rotating in a circle
- Think about what it looks like from the *outside*
- Bus slams on brakes → bus accelerates backwards, passengers don't
- Car turns left → car accelerates left, passengers keep going straight
- Bucket accelerates toward center of circle → bucket must push on frog to make it accelerate with it

Two sample problems

I'm going to give you two problems, one at a time, to do.

These are similar to exam problems. I want you to work them out, in full, on your own paper. Then I'll do them.

Raise your hand if you have questions, and I'll come up to your seat.

We'll spend the rest of class on this.