Problem solving: kinematics (II)

Physics 211
Syracuse University, Physics 211 Spring 2023
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February 1, 2023

Announcements

- Homework 2 due date is **tomorrow**
- Exam 1 is next Tuesday
  - No homework due next week
  - HW2 problems are similar to those on Exam 1
  - Next recitation is your group practice exam
  - If you must miss, notify your TA in advance and explain to them why you will be absent
  - If your absence is for a justified reason (see the syllabus), we will give you your grade on Exam 1 as a replacement for Group Exam 1
    - Saturday: Exam review in Stolkin, 5-8 PM

Exam 1

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- The exam will be somewhat easier than the homework.
- There will be one problem where you need the quadratic formula
  - ... this means interpreting the two values it spits out
- There will be at least one instance where you need to interpret or sketch position, velocity, and acceleration graphs
- There will be one problem where you need to do vector addition
- You will *not* need to compute derivatives or integrals algebraically
- The exam will be four or five problems

Exam 1, protocol

- You will have assigned seats; we will post a seating chart before the exam
- If you are left-handed, please send me an email so we can get you a left-handed desk
- You are allowed to bring one page of notes that *you handwrite yourself*
  - No typed notes unless you have a disability that prevents you from writing
  - Your friend can't write it
  - You can't photocopy stuff from the book
  - It won't help you as much anyway

Problem solving: 2D kinematics, constant acceleration

1. 1. If you have vectors in the "angle and magnitude" form $(\vec{a}, \vec{v}, \vec{s})$, convert them to components
2. 2. Write down the kinematics relations, separately for x and y
   - Many terms will usually be zero
   - Freefall: $a_x = 0$, $a_y = -g$ (with conventional choice of axes)
3. 3. Understand what instant in time you want to know about: ask the right question
4. 4. Put in what you know; solve for what you don't (using substitution, if necessary)
5. 5. Think about the physical meaning of your solution

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Do you have any questions from homework or recitation this week?

A demonstration: independence of x and y

Will the ball land back in the cart?

Can we tell without doing any mathematics?

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A rocket

A rocket is launched from rest on level ground. While its motor burns, it accelerates at 10 m/s at an angle 30° below the vertical. After $\tau = 10$ s its motor burns out and it experiences freefall until it hits the ground.

- How far does it go?
- Graph acceleration, velocity, and position in both $x-$ and $y-$