Welcome to Mechanics!

- Things to do before next class:
  - Check out the class webpage:
    `http://www.willamette.edu/~jjrembold/classes/phys339/phys339/`
  - Read over syllabus
  - Make sure you have the book and **read the rest of Chapter 1**
  - Get added to the class in Gradescope
    - I am working on getting out the invites. Should have them out this afternoon.
  - Get added to the class in Discord
    - You also should have gotten an invite email, or you can use your old login
  - I recommend bringing a laptop to class if you can, just to help facilitate discussions
- Things to do this week
  - Homework 1 will be posted today and will be due at midnight on Monday
  - Have Anaconda installed on a laptop you can bring to class on Monday
    - Ensure you can create or open a Jupyter Notebook
    - See me if you need assistance with any of these things!

My Vitals

- Office: Collins 311 (it's shared)
- Office Hours: M,W 3:15-5pm and anytime online
- Email: jjrembold@willamette.edu
- Phone: 503-370-6860

Important Stuff

- Homework - 35%
  - Assignments due weekly on Monday evening at midnight
- CompDays - 15%
  - Projects due weekly (generally) on Wednesday evening at midnight
- Midterm - 15%
  - Will be take-home
  - Currently scheduled to be due Oct 21
- Project - 15%
  - Readings will be last day of class
  - Chance to explore an uncovered chapter in Taylor
- Final - 20%
  - Also take-home
  - Due whenever they actually figure out the Final's schedule...

Important Websites

- The class website
  - Where homework, and lecture slides will be posted
  - Where the updated schedule will have reading requirements
- Gradescope
  - Where all homework will be submitted as pdfs
  - Please format homework questions with a new page for each problem
- Discord
  - Class discussion area for asking questions, responding to other's questions, and general communication
  - You'll get an invite for both the class specific server as well as the dept server.

Advice

- Read the assigned material before class, and feel free to submit any major questions to Discord.
  - If you give me enough time, I may be able to tailor some comment to address that specific question.
- Come to class (in person or remotely) and participate in the questions and discussions
- Start your homework early to ensure it is making sense
- Don't work alone!
- Ask questions! In person or via remote text or voice!
- Don't fall behind!

MECHANICS

So what is Mechanics really about?

If you recall...

MECHANICS

So what is Mechanics really about?

Fixing old cars?

If you recall...

MECHANICS

So what is Mechanics really about?

~~Fixing old cars?~~

Understanding and predicting the motion of "everyday objects"

If you recall...

Take 5 minutes with a partner to map out all the mechanics concepts you *already know* (there are a lot!), and how they might be related to one another.

Q1

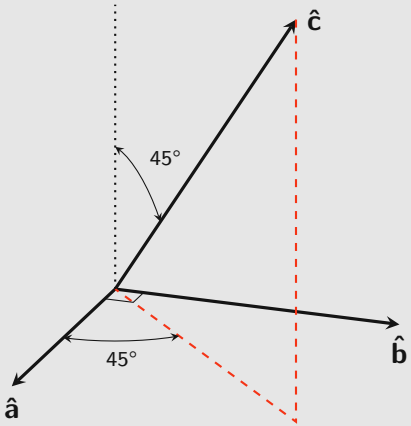
We say that "classical" mechanics breaks down at the really tiny or the really fast. How fast can we go though and still have classical mechanics hold true? Suppose you wanted an error of no more than 1% from true relativistic momentum in your momentum calculation. What speed would this correspond to? A reminder that relativistic momentum is given by:

$$p = \frac{mv}{\sqrt{1 - \frac{v^2}{c^2}}}$$

A) 0.14c
B) 0.27c
C) 0.99c
D) 0.89c

Q2

Consider the alternative coordinate system below:



Suppose a general vector is given by:

$$\vec{\mathbf{v}} = A\hat{\mathbf{a}} + B\hat{\mathbf{b}} + C\hat{\mathbf{c}}$$

What expression best describes $\frac{\mathrm{d}\vec{\mathbf{v}}}{\mathrm{d}t}$?

A) $\dot{A}\,\hat{\mathbf{a}} + \dot{B}\,\hat{\mathbf{b}} + \dot{C}\,\hat{\mathbf{c}}$

B) $\dot{A}\,\hat{\mathbf{a}} + \dot{B}\,\hat{\mathbf{b}} + \frac{\dot{C}}{\sqrt{2}}\,\hat{\mathbf{c}}$

C) $\frac{\dot{A}}{\sqrt{2}}\,\hat{\mathbf{a}} + \frac{\dot{B}}{\sqrt{2}}\,\hat{\mathbf{b}} + \dot{C}\,\hat{\mathbf{c}}$

D) $\frac{\dot{A}}{\sqrt{2}}\,\hat{\mathbf{a}} + \frac{\dot{B}}{\sqrt{2}}\,\hat{\mathbf{b}} + \frac{\dot{C}}{2}\,\hat{\mathbf{c}}$

Q3

Suppose you have the two vectors:

$$\vec{\mathbf{A}} = 3\hat{\boldsymbol{x}} + 8\hat{\boldsymbol{y}} - 2\hat{\boldsymbol{z}}$$
$$\vec{\mathbf{B}} = -3\hat{\boldsymbol{y}} + 5\hat{\boldsymbol{z}}$$

What then is the result of the following expression?

$$(\vec{\mathbf{A}} \times \vec{\mathbf{B}}) \cdot \vec{\mathbf{A}}$$

A) -163
B) $9\hat{\boldsymbol{x}} - 192\hat{\boldsymbol{y}} + 20\hat{\boldsymbol{z}}$
C) $102\hat{\boldsymbol{x}} - 120\hat{\boldsymbol{y}} + 18\hat{\boldsymbol{z}}$
D) Something else