PHYS 1210
Engineering Physics I

Prof. Jang-Condell

MWF 12:00-12:50pm, CR 214

Meet and Greet

- Introduce yourself to at least 2 other students you don't already know
- Exchange contact info so you have fellow students to turn to for help
- Pickup a syllabus and a short survey. Turn in completed surveys at the end of class.

Contact Info

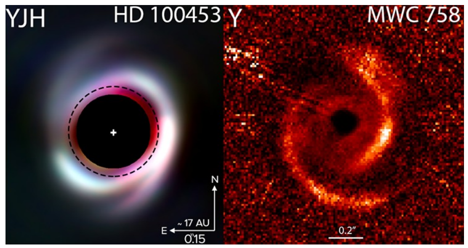
- Prof. Jang-Condell
- hjangcon@uwyo.edu
- PS 329
- (307) 766-3680
- office hours: M 1-2pm & Th 1-3pm or by appt

A little bit about me

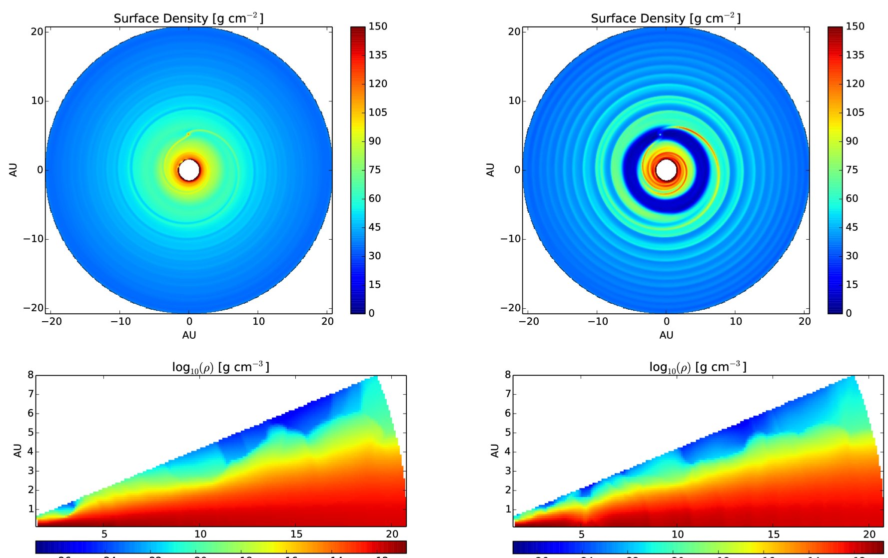
- Astrophysicist
- Research interests:
  - Computation and Theory
  - Extrasolar planets
  - Planet formation

Simulations of Planet Formation

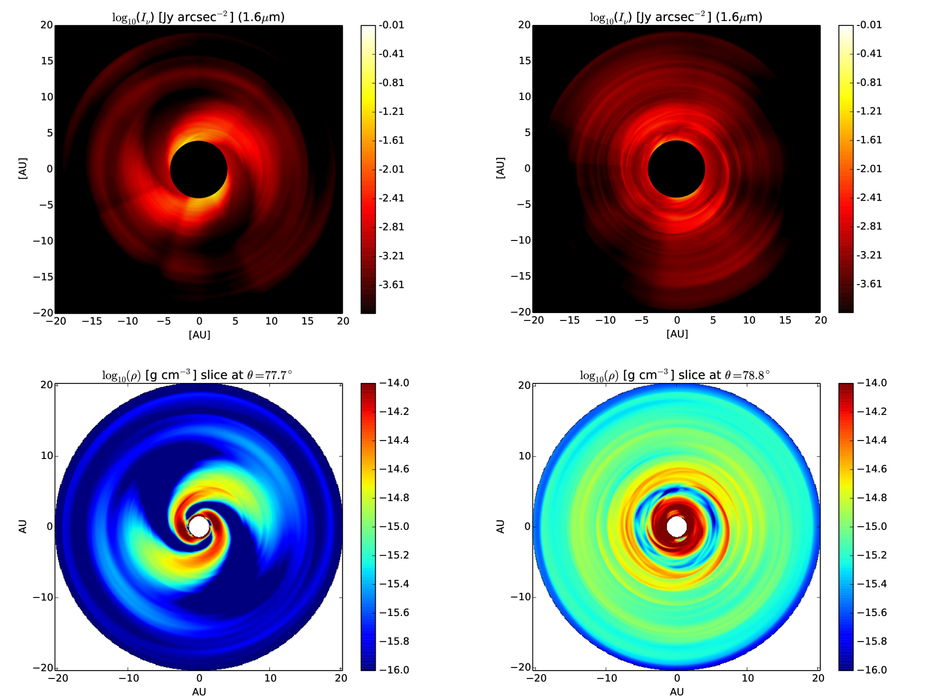
Motivation: Not only have recent observations shown the presence of gaps in protoplanetary disks (i.e. HL Tau), some reveal a spiral arm structure such as HD 100453 (Wagner et al. 2015) and MWC 758 (Benisty et al 2015). Radiative transfer methods applied to HD simulations can help us identify the properties of theses systems.



Hydrodynamic Simulations:
Modeling Gap Openings in Protoplanetary Disks



Observable Signatures:
Applying Radiative Transfer Methods to HD Results



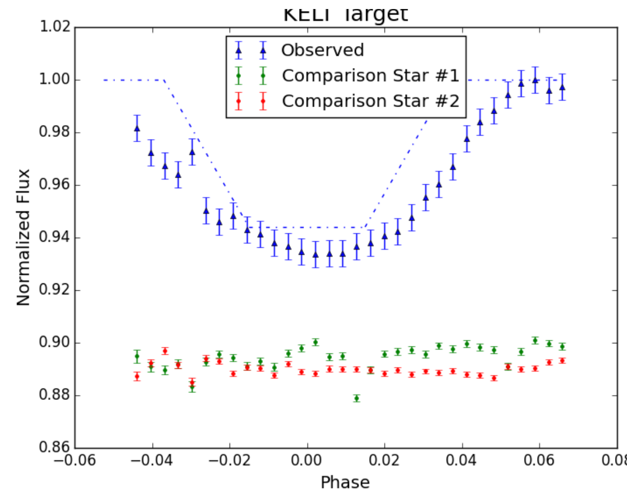
Left Columm: 15 Earth-mass planet at 5.2 AU after 50 orbits. **Right Column:** Jupiter-mass planet, 120 orbits. **Top:** Scattered light from surface of disk observed at 1.6 microns using the methods of Jang-Condell and Turner (2012). **Bottom:** Density profile at disk surface.

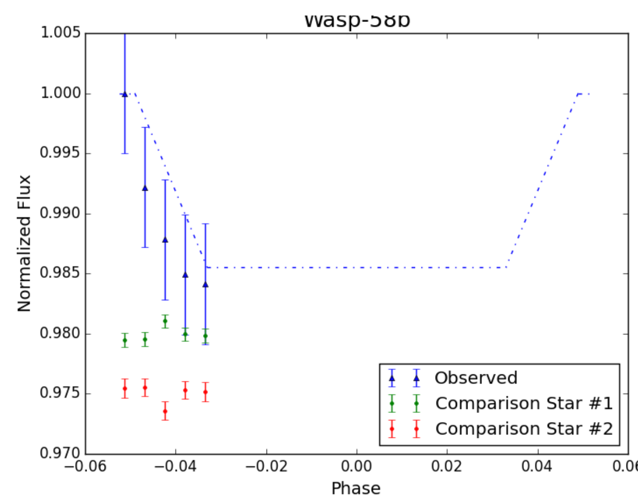
Dylan Kloster, David Kasper

Exoplanet Detection at Red Buttes Observatory

Tyler Ellis,
Rex Yeigh,
David Kasper

Exoplanet Detection at Red Buttes Observatory





Tyler Ellis,
Rex Yeigh,
David Kasper

TAs

Shane Allison	Discussions
Cody Minns	Discussions & Labs
Subash Kattel	Labs

Labs and Discussion

- Make sure you are signed up for one of each!

Grading

- 2 Midterm exams: 20% each
- 1 Final exam: 20% (non-cumulative)
- Homework: online 10%, written 5%
- Labs 20%
- Polleverywhere 5%

Exam Schedule

- Thursday, March 3, 5-7pm
- Thursday, April 14, 5-7pm
- Final Exam: Friday, May 13, 10:15-12:15

Homework

1. Online: Masteringphysics.com
    - due 10pm on Fridays
2. Written: 2 problems per week
    - due at beginning of class on same day as online assignment

Working in groups: acknowledge your co-workers

Labs

- Pre-lab due at beginning of lab
- Post-lab turned in beginning of next lab
- Lab this week: BRING A BUBBLE SHEET!

Discussions

- Graded written homework will be returned in discussion sections
- TAs will help you with problem solving. They will not work problems for you, rather they will guide you through how to get to the solutions.
- No discussion this week

Polleverywhere

- Signup at http://polleverywhere.com
- Once you are signed up, you can vote via text or at http://PollEv.com/PHYS1210JC

Introduction to Physics

- Physics describes how the universe works from the largest scales down to the smallest, including everyday life

Video

What forces do you see in action in the video?

Respond at **PollEv.com/physjc**

Text **136080** and your message to **22333**

- https://www.youtube.com/watch?v=qybUFnY7Y8w

Vectors

Vectors and scalars

- A *scalar quantity* can be described by a *single number*.
- A *vector quantity* has both a *magnitude* and a *direction* in space.
- In this book, a vector quantity is represented in boldface italic type with an arrow over it: $\vec{A}$.
- The magnitude of $\vec{A}$ is written as A or $|\vec{A}|$.

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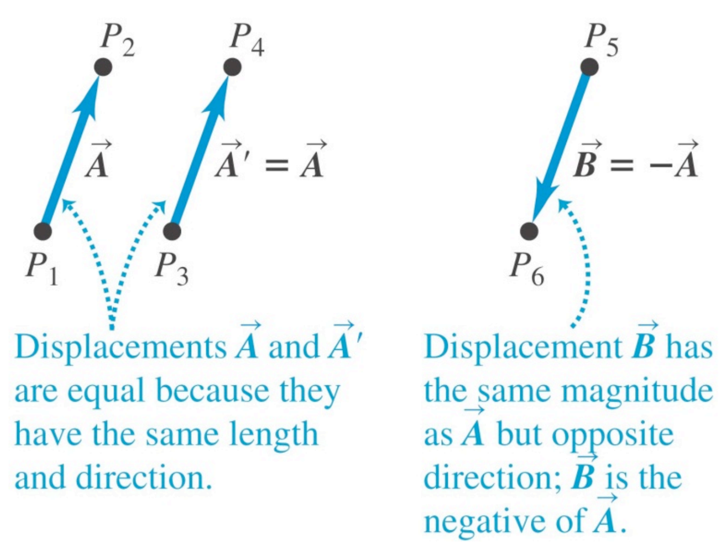
Drawing vectors—Figure 1.10

- Draw a vector as a line with an arrowhead at its tip.
- The *length* of the line shows the vector's *magnitude*.
- The *direction* of the line shows the vector's *direction*.
- Figure 1.10 shows equal-magnitude vectors having the same direction and opposite directions.



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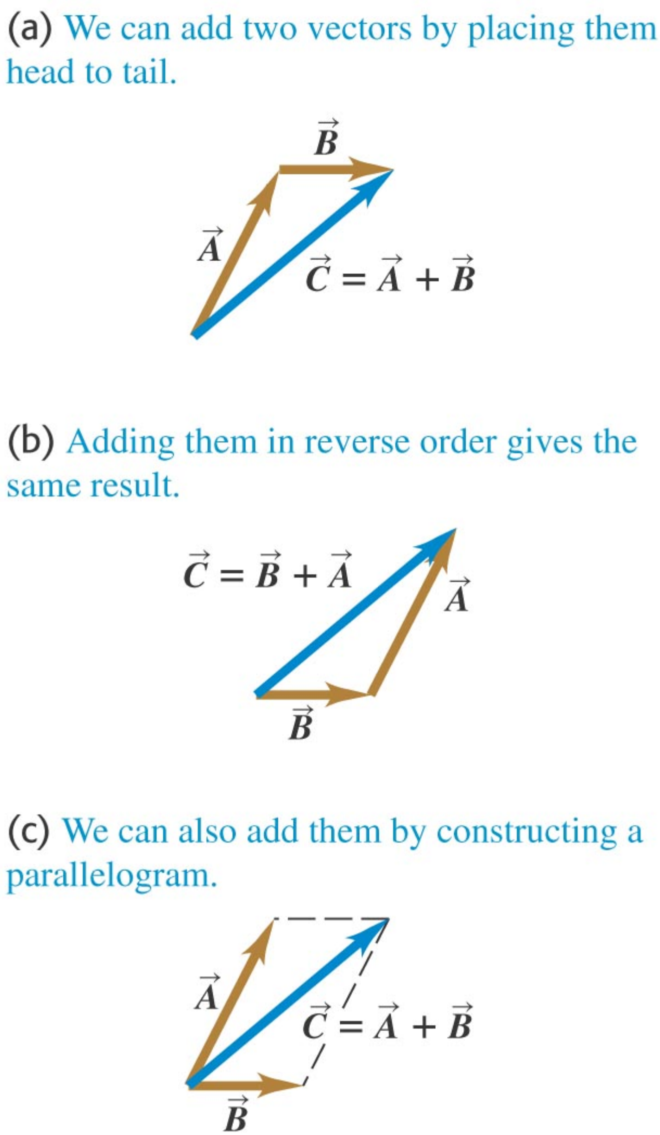
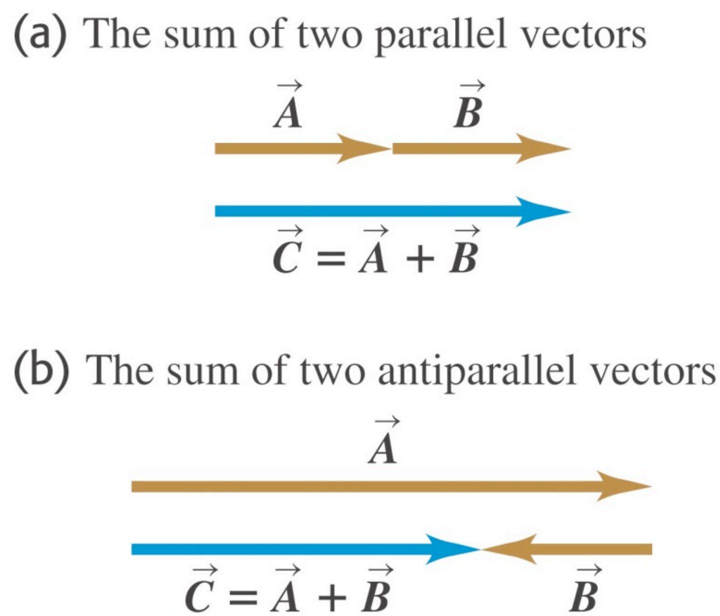
Adding two vectors graphically—Figures 1.11–1.12

- Two vectors may be added graphically using either the *parallelogram* method or the *head-to-tail* method.





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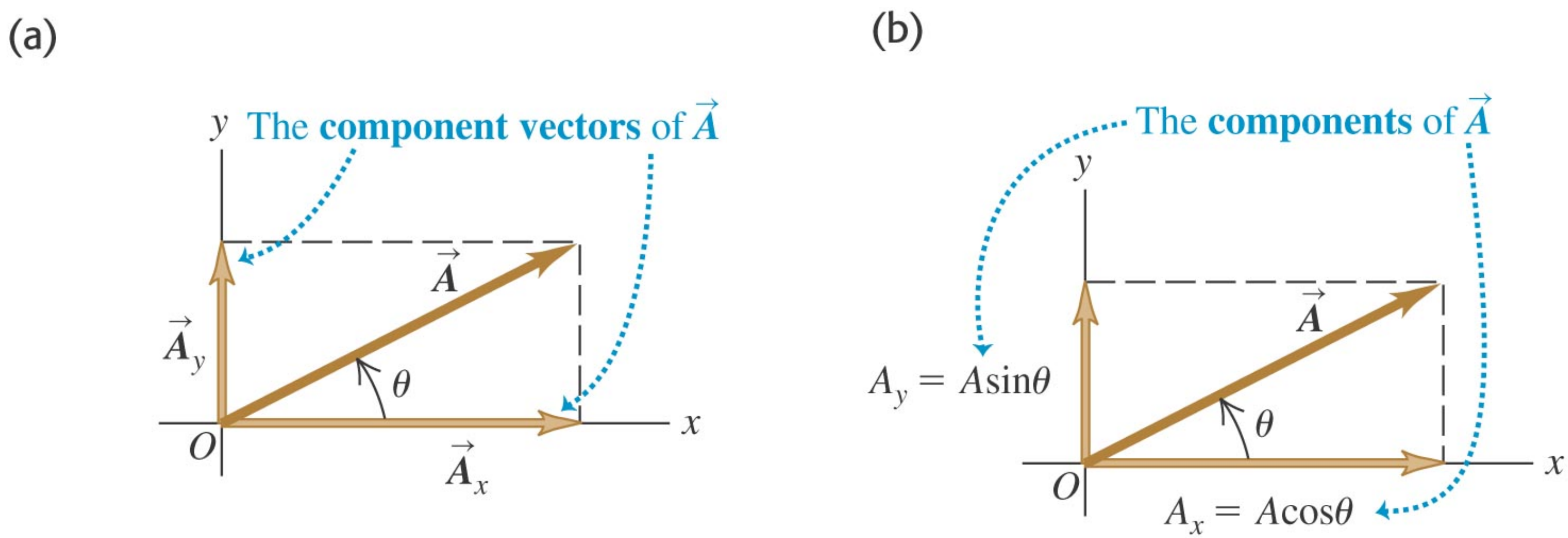
Components of a vector—Figure 1.17

- Adding vectors graphically provides limited accuracy. Vector components provide a general method for adding vectors.
- Any vector can be represented by an x-component A_x and a y-component A_y.
- Use trigonometry to find the components of a vector: $A_x = A\cos\theta$ and $A_y = A\sin\theta$, where θ is measured from the $+x$-axis toward the $+y$-axis.



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Calculations using components

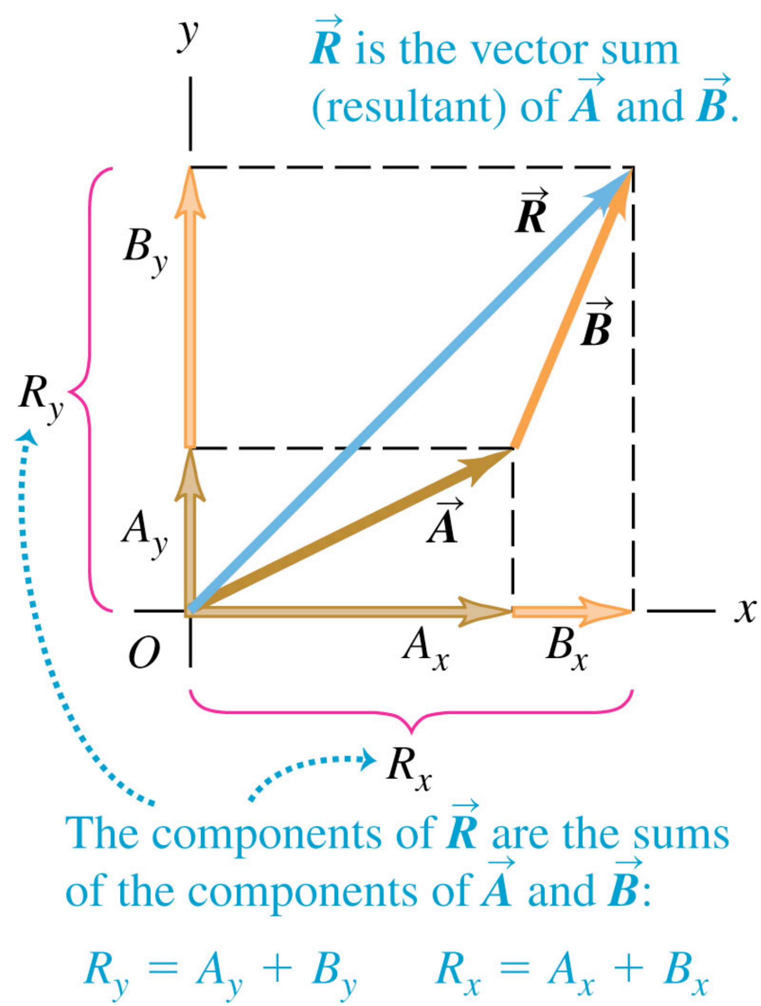
- We can use the components of a vector to find its magnitude and direction:

$$A = \sqrt{A_x^2 + A_y^2} \quad \text{and} \quad \tan\theta = \frac{A_y}{A_x}$$

- We can use the components of a set of vectors to find the components of their sum:

$$R_x = A_x + B_x + C_x + \cdots, \quad R_y = A_y + B_y + C_y + \cdots$$

- Refer to Problem-Solving Strategy 1.3.



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Example Problem

You are working for the summer on the Wyoming Search and Rescue squad when you get a call of a downed aircraft. The plane took off from Cheyenne at 12:15, flew north 100 miles, and then 80 miles in a direction 30 degrees north of west, where it vanished from radar at 1:05.

a) What was the average speed of the plane?

b) What was the average velocity of the plane?

c) In which direction and how far from Cheyenne should your team fly?

Units

Standards and units

- Length, time, and mass are three *fundamental* quantities of physics.
- The *International System* (SI for *Système International*) is the most widely used system of units.
- In SI units, length is measured in *meters*, time in *seconds*, and mass in *kilograms*.

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Unit prefixes

- Table 1.1 shows some larger and smaller units for the fundamental quantities.

Table 1.1 Some Units of Length, Mass, and Time

Length	Mass	Time
1 nanometer = 1 nm = 10^{-9} m (a few times the size of the largest atom)	1 microgram = 1 μg = 10^{-6} g = 10^{-9} kg (mass of a very small dust particle)	1 nanosecond = 1 ns = 10^{-9} s (time for light to travel 0.3 m)
1 micrometer = 1 μm = 10^{-6} m (size of some bacteria and living cells)	1 milligram = 1 mg = 10^{-3} g = 10^{-6} kg (mass of a grain of salt)	1 microsecond = 1 μs = 10^{-6} s (time for space station to move 8 mm)
1 millimeter = 1 mm = 10^{-3} m (diameter of the point of a ballpoint pen)	1 gram = 1 g = 10^{-3} kg (mass of a paper clip)	1 millisecond = 1 ms = 10^{-3} s (time for sound to travel 0.35 m)
1 centimeter = 1 cm = 10^{-2} m (diameter of your little finger)		
1 kilometer = 1 km = 10^{3} m (a 10-minute walk)		

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Sample Problem

- A car driving along at 50 mph. How fast is this is m/s?

Sample Problem

- Your physics instructor is pacing in front of the classroom at 1 m/s. How fast is this in miles per hour?

Checklist

- ✓ turn in surveys
- ✓ sign up for MasteringPhysics
- ✓ sign up for PollEverywhere
- ✓ go to lab this week
- ✓ complete homework #0 by Friday