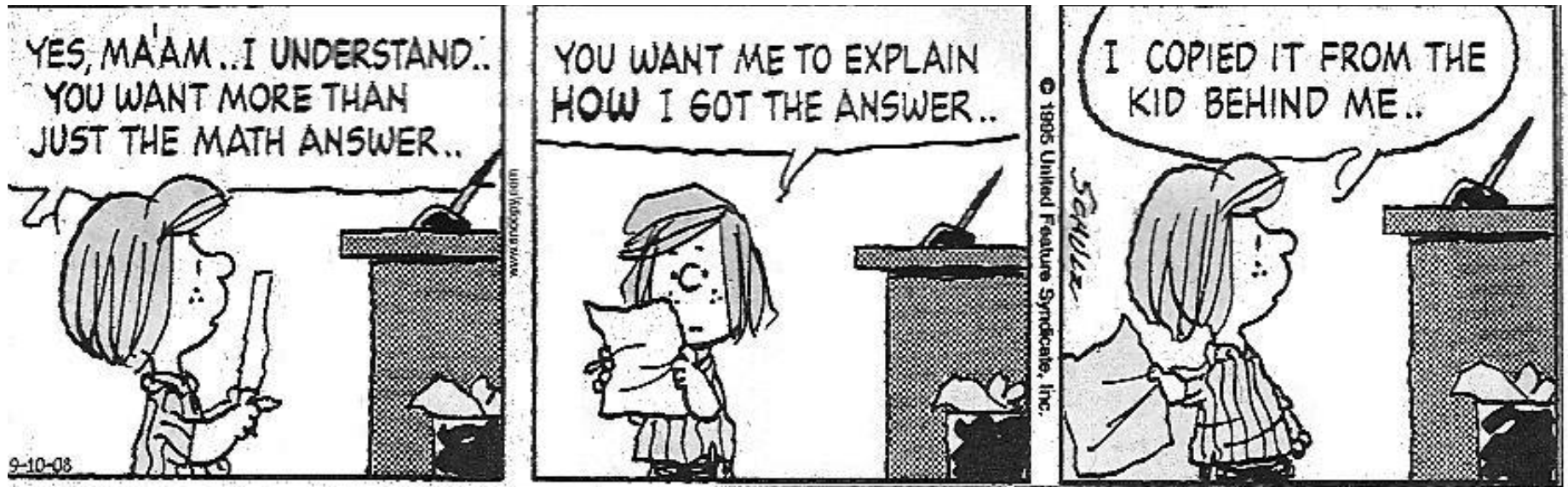


■ **Theme Music: The Outlaws of Physics**

Walk Don't Run

■ **Cartoon:**

Charles Schultz *Peanuts*



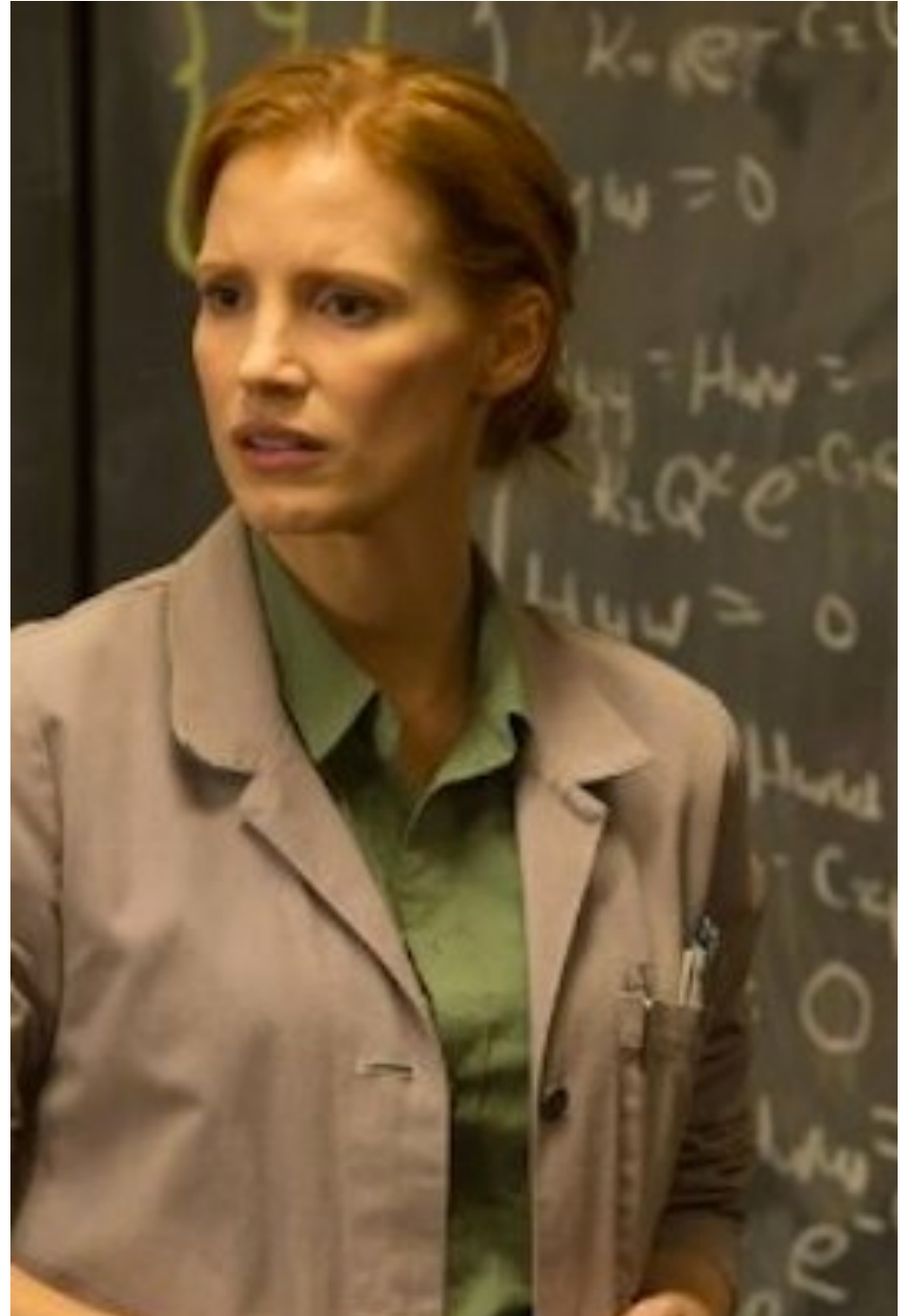
The Equation of the Day

Functions

$$x(t)$$

9/4/15

8



Cat television



- When we do science, we don't try to solve the entire universe at once.
- We restrict our considerations to a limited set of data and try to understand it. Only when we get it do we try to expand further to more situations.
- This is like looking out a window onto a small segment of the world. Since cats like to do this, I call the process “choosing a channel on cat television.”

The Main Question

(for this term, at least)



- Start by choosing a big question and then refining it:

How do things move?

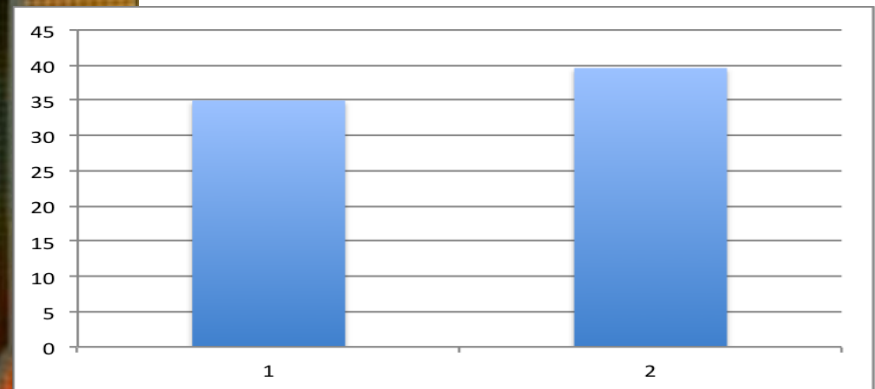
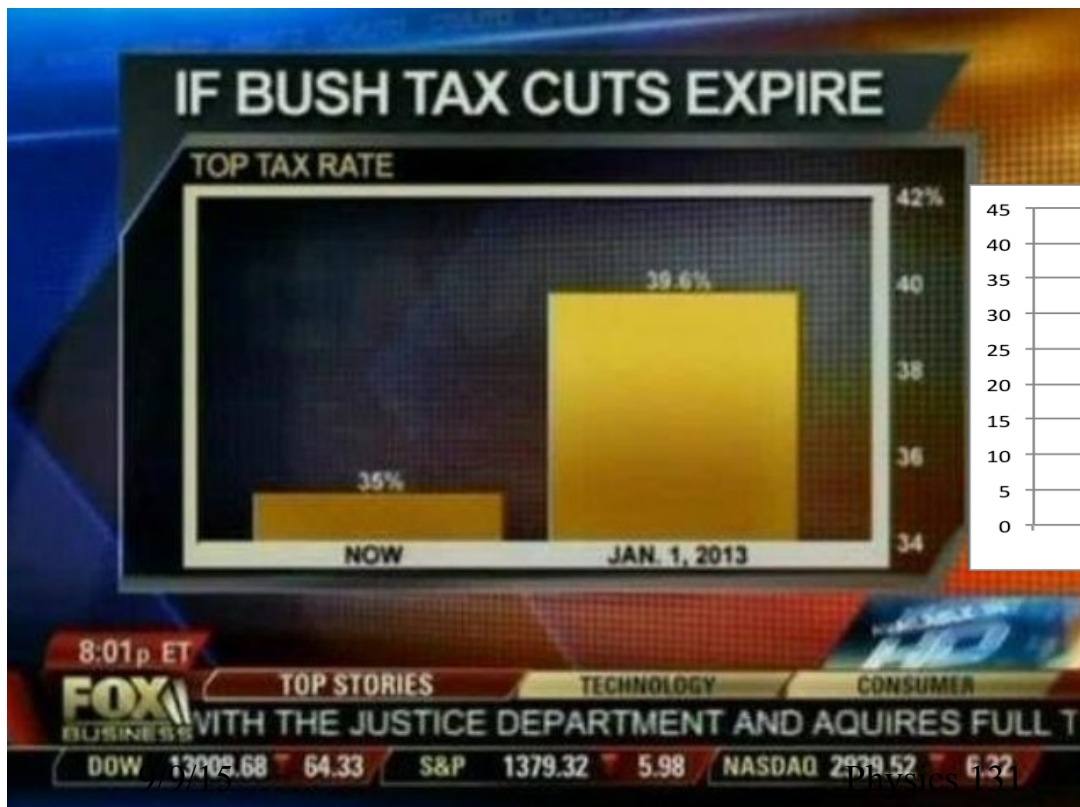
Why choose this?

- concepts of measurement, rate of change, and force are basic - set frame for what are appropriate terms to use to think about motion.
- ties to everyday experience so can use and learn to build/refine intuition

i.e., they don't need any causes.

Reading questions

- Can you give us an example of how a suppressed zero would magnify the variation in a curve?



Foothold ideas: Measuring “where”



- In order to specify where something is we need a coordinate system. This includes:
 1. Picking an origin
 2. Picking perpendicular directions
 3. Choosing a measurement scale

*Can position be negative?
What would that mean?*

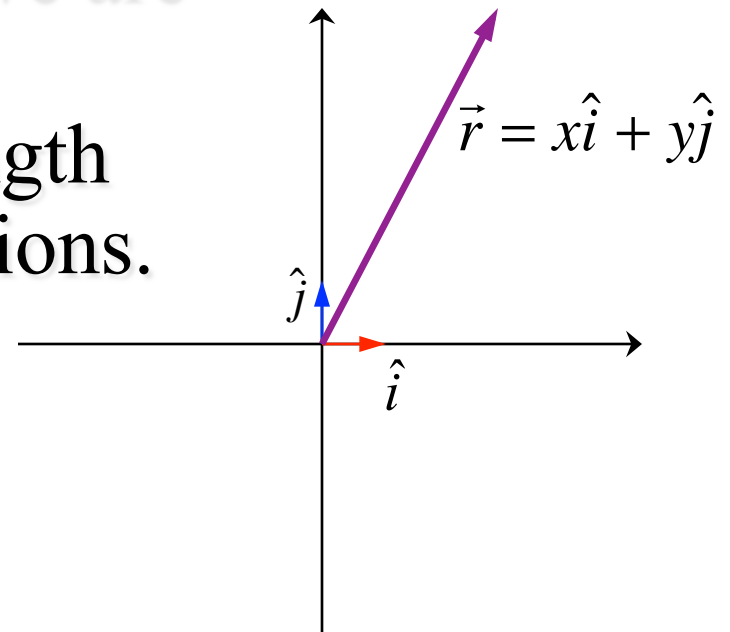
- Each point in space is specified by three numbers: (x, y, z) , and a position vector— an arrow showing the displacement from the origin to that position.
- Vectors add like successive displacements or algebraically by

$$\vec{A} = A_x \hat{i} + A_y \hat{j} \qquad \vec{B} = B_x \hat{i} + B_y \hat{j}$$

$$\vec{A} + \vec{B} = (A_x + B_x) \hat{i} + (A_y + B_y) \hat{j}$$

Notation

- We specify the directions we are talking about by drawing two little arrows of unit length in two perpendicular directions.
- “ x ” and “ y ” are called the coordinates and can be positive or negative.
- Note that if x is negative, it means $x\hat{i}$ is a vector pointing in the direction opposite to \hat{i}



Foothold ideas: Measuring “when”



- Time is a coordinate just like position
 - We need an origin (when we choose $t = 0$)
 - a direction (usually times later than 0 are +)
 - a scale (seconds, years, millennia)
- Note the difference between
 - clock reading, t
 - a time interval, Δt

This is like the difference between position and length!