Theme Music: The Outlaws of Physics
Walk Don’t Run

Cartoon:
Charles Schultz Peanuts
The Equation of the Day

Functions

\( x(t) \)
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.
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

- 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

\[
\vec{A} = A_x \hat{i} + A_y \hat{j} \quad \vec{B} = B_x \hat{i} + B_y \hat{j}
\]

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

\[ \vec{r} = x\hat{i} + y\hat{j} \]
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, \( \Delta t \)

This is like the difference between position and length!