Topic 1: 2D Motion

PHYSICS 231
Current Assignments

• Homework Set 1 due this Thursday, Jan 20, 11 pm

• Homework Set 2 due Thursday, Jan 27, 11pm

• Reading: Chapter 4,5 for next week
Key Concepts: 2D motion

• Vector. Displacement, Velocity, and Acceleration are vectors.

• Representations: Graphical, angle and magnitude, components.

• Add, subtract vectors. Decompose in components, and add components to obtain total vector.

• Treat 2D motion as 2 separate problems, one for x-direction and one for y-direction. (decompose all vectors in x- and y- components)
Vector Concept

• A vector is a quantity that has a direction and a magnitude

• Examples so far: displacement, velocity, and acceleration

• In 1D the direction was given by the sign and a coordinate axis direction.

• In 2D it's more complicated. Different representations can be used
Representation: Graphical

• Graphically as arrow:
  – Direction is direction of arrow
  – Magnitude is length of arrow (need to define some scale)

• Note: where one draws the arrow is irrelevant.

• Addition by adding arrows (form a chain)
• Subtraction by adding a inverted arrow
2D Motion Concepts

• Treat as two separate 1D problems with time as the common parameter

• In X-direction (calculate with x-components):

\[ v_x(t) = v_{0x} + a_x t \]
\[ x(t) = x_0 + v_{0x} t + \frac{1}{2} a_x t^2 \]

• In Y-direction (calculate with y-components):

\[ v_y(t) = v_{0y} + a_y t \]
\[ y(t) = y_0 + v_{0y} t + \frac{1}{2} a_y t^2 \]