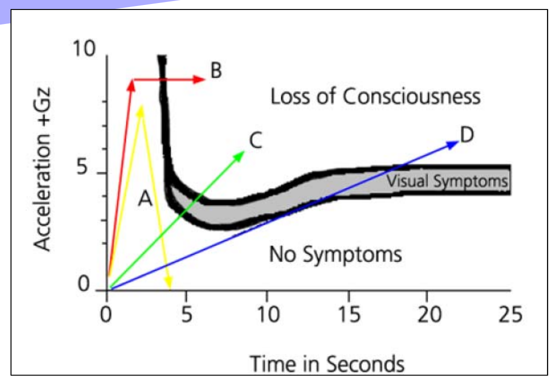
PHYS 210 - General Physics I

- Base Groups
- Uniform motion
- Derivatives
- Average and instantaneous acceleration
- Problem solving
- Motion at a constant acceleration



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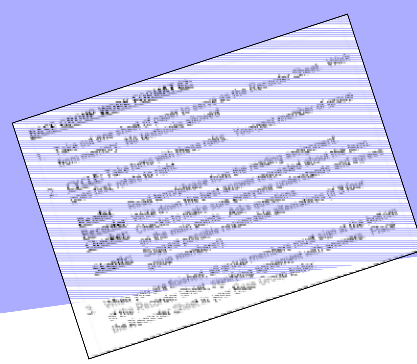
Base Group Meeting


BASE GROUP WORK FORMAT

1. Take out one sheet of paper to serve as the Recorder Sheet. Work from memory. No textbooks allowed.
2. CYCLE: Take turns with these roles. Youngest member of group goes first; rotate to right.

Reader: Read term/phrase from the reading assignment.
Recorder: Write down the best answer requested about the term.
Checker: Checks to make sure everyone understands and agrees on the main points. Asks questions.
Skeptic: Suggest possible reasonable alternatives (if 4 group members).

3. When you are finished, all group members must sign at the bottom of the Recorder Sheet, ... with answers. Place the Recorder Sheet in your Base Group folder.

- BGDG: Favorite recording artist/band?
- BGWS
- Group Processing
- RQ

Motion at constant velocity: Uniform Motion

- If speed and direction are CONSTANT and since $\vec{v} = \frac{\Delta \vec{r}}{\Delta t}$

  then (dropping the vector notation)

  $s_f = s_i + v_s \Delta t$

  (here, $\Delta r = s_f - s_i$)

ALSO: $x_f = x_i + v \Delta t$ or $x = x_o + v_x \Delta t$

or $y = y_o + v_y \Delta t$

EX:

- A car starts at origin of some reference frame at a constant velocity of 20 m/s, east . How far from origin will it have traveled after 10 minutes?

Instantaneous velocity (instantaneous speed)

In the limit that Δt goes to zero ...
we get the instantaneous velocity.

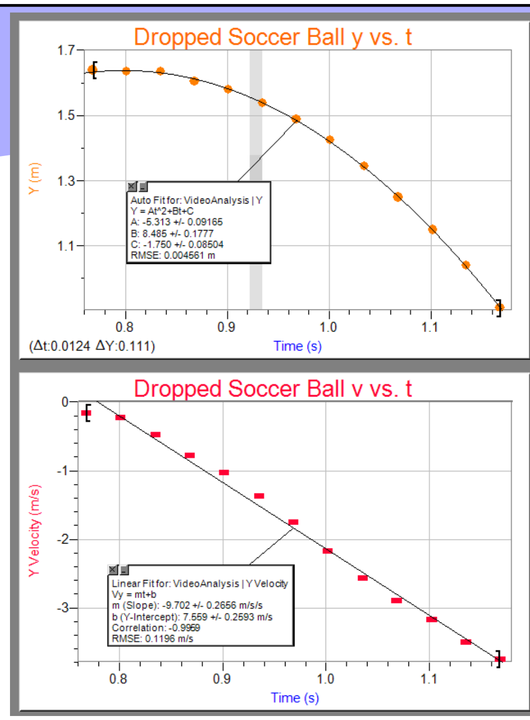
$$v = \lim_{\Delta t \to 0} v_{avg} = \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} = \frac{dx}{dt}$$

Velocity (speed) is the derivative of *x* with respect to *t*.

Instantaneous velocity (instantaneous speed)

- How do we interpret the derivative?
- The **derivative** of a function with respect to some variable is equal to the **slope** of the function when plotted against that variable.
- So, for $v = \frac{dx}{dt}$, v is the slope on a graph of x vs. t.

From Lab



The derivative – in general

- The derivative of a function, F (of one variable, say, x) graphically represents the slope on a plot of F(x) vs. x.
- Mathematically, it is defined as a limit.
- "Taking the derivative" of a function, from a practical standpoint, can be viewed as using an appropriate template or recipe.
- Example: polynomials

Derivatives – try some!

Use:
$$\frac{d}{dx}\left(x^n\right) = nx^{n-1}$$
$$\frac{d}{dx}\left(C\right) = 0 \quad \forall \quad \text{constants } C$$

1. Find dF/dx if $F(x) = 2x^3 + 1$
2. Find dG/dt if $G(t) = 9t - 7t^4 + 55$
3. Find dH/dy if $H(y) = 6 + y^{-2} + 3y^8$

Have a great Monday!