

Graphical Analysis of \vec{d} vs. t and \vec{v} vs. t Graphs

Purpose - to learn to recognize the various shapes of plots of moving objects and to understand the physical meanings of slope and area on \vec{d} vs. t and \vec{v} vs. t graphs.

Procedure -

- 1.) From the windows desktop double click on the desktop tools icon, physics apps, IP player. Click file, open, and double click on sim_03.ip.
- 2.) Maximize your screen to see the entire experiment by clicking on the  icon in the upper right hand corner.
- 3.) Set the acceleration of the car to zero. Leave velocity at $+2.00 \frac{m}{s}$. Run the experiment. Sketch and title both graphs, and record the information in the table between the graphs. This table shows the final values of displacement, velocity, and time.
- 4.) Reset the experiment. Change the initial velocity to $+5.00 \frac{m}{s}$ and run again. Sketch the graphs and record the table values. Do a slope calculation for the d vs. t graph, include a unit calculation. Calculate the area under the velocity time graph, do a unit calculation.
- 5.) Reset the experiment. Set the acceleration to $+1.00 \frac{m}{s^2}$. Run, sketch the graphs and record the table values. Calculate the slope of the velocity time graph, include a unit calculation.
- 6.) Reset the experiment. Change the acceleration to $-1.00 \frac{m}{s^2}$. Run and sketch the graphs and record the table values.
- 7.) Close the application by pressing Alt-F4.

Discussion -

- 1.) How does the slope of the \vec{d} vs. t graph change between procedures 3 and 4?
- 2.) You should notice something about the slope found in procedure 4 and the velocity. Make a statement comparing the slope and velocity.
- 3.) You should notice something about the area found in procedure 4 and the displacement. Make a statement comparing the area and displacement of the object.
- 4.) What is the meaning of the slope of a \vec{v} vs. t graph?
- 5.) Describe the graph of \vec{d} vs. t in procedure 5.
- 6.) In procedure 6 the graph of \vec{d} vs. t has a maximum value, when the car is at this distance what is happening? What happens before the car reaches this point, what happens after?
- 7.) When is a negative acceleration different from deceleration?

Conclusion - Answers the purpose! That is describe what the slope of \vec{d} vs. t and \vec{v} vs. t graphs are and what the area under a \vec{v} vs. t graph tells one.