Kinematic Graphing Simulation

Purpose: To gather information about the position-time, velocity-time, and acceleration-time graphs for various types of motion and to make generalizations in order to make some claims that relate the motion characteristics to the graph features

Getting Ready: Navigate to the **Kinematic Graphing Simulation** found in the **Physics Interactives** section at **The Physics Classroom**.

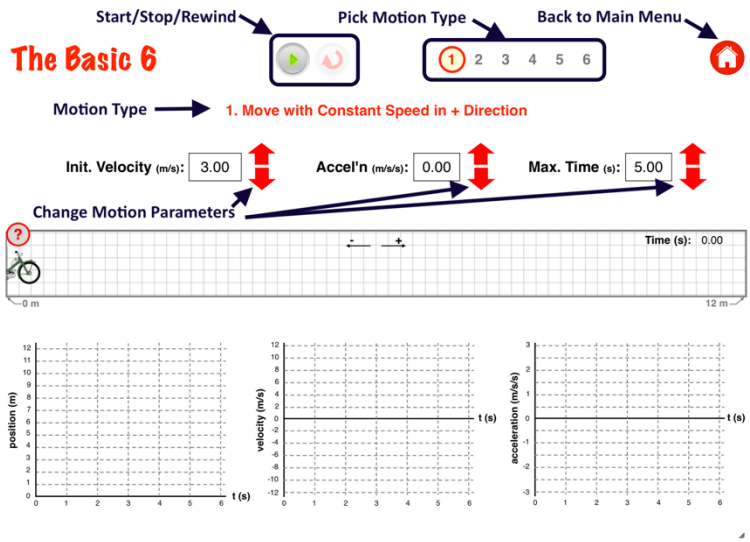
https://www.physicsclassroom.com/Physics-Interactives/1-D-Kinematics/Kinematic-Graphing

Navigation:

www.physicsclassroom.com => Physics Interactives => 1-Dimensional Kinematics => Kinematic Graphing

Getting Acquainted/Play:

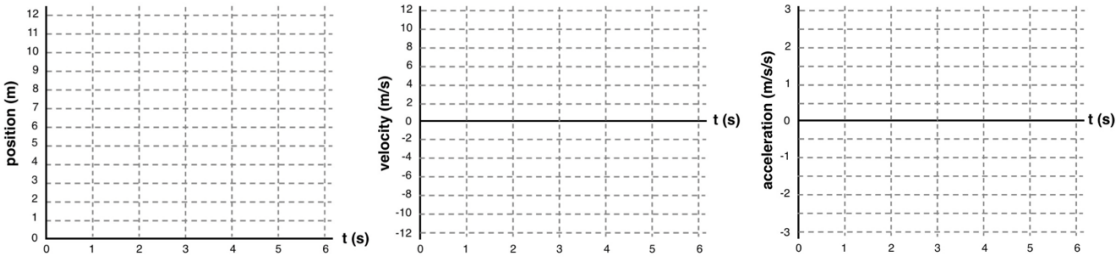
This interactive consists of three parts. You will begin with **The Basic 6**. Tap on the **Start** button for The Basic 6 on the Main Menu. Observe the Controls at the top of the screen. Take some time to experiment with them. Learn how to Start, Stop, and Rewind a simulation. Learn how to toggle between the six different motion types. And learn how to change the three motion parameters from their pre-set values. Once you have familiarized yourself with the interface, begin the procedure below.



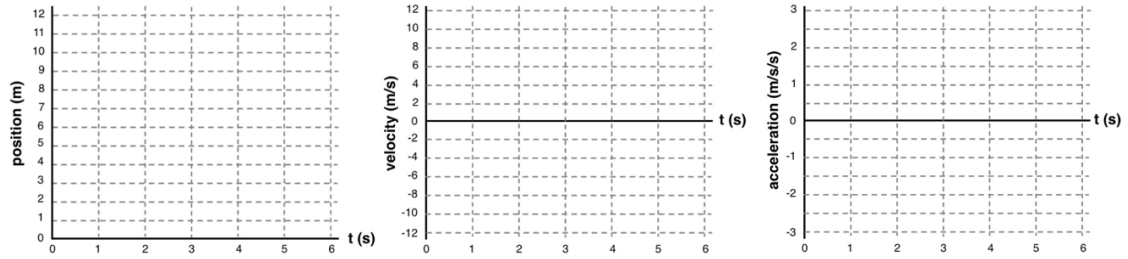
Part 1: Graphs for Six Basic Motion Types

Run the simulations and sketch the three graphs for all six motion types. When sketching graph lines, give attention to whether the lines are horizontal, straight/diagonal, or curved.

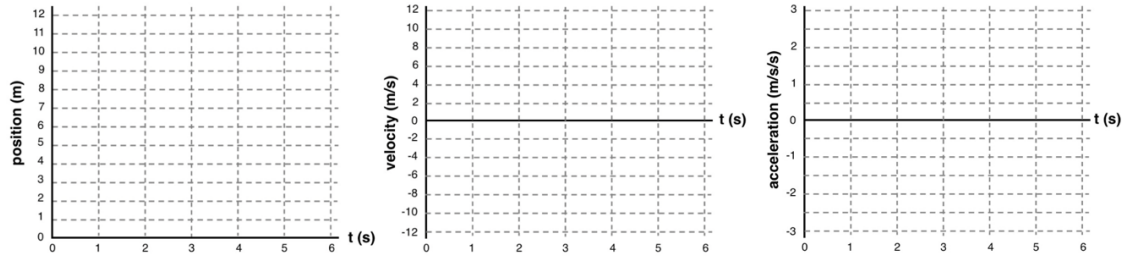
Motion Type 1: Move with Constant Speed in + Direction



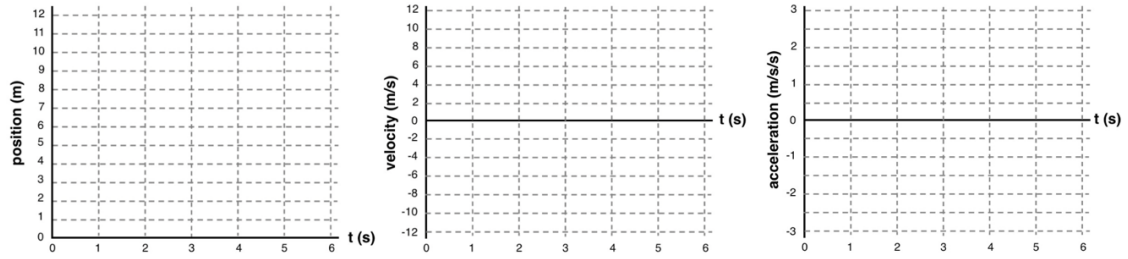
Motion Type 2: Move with Constant Speed in - Direction



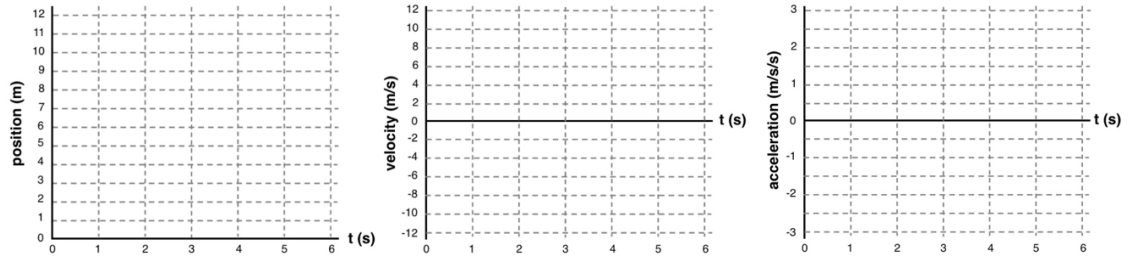
Motion Type 3: Move in + Direction; Speeding Up



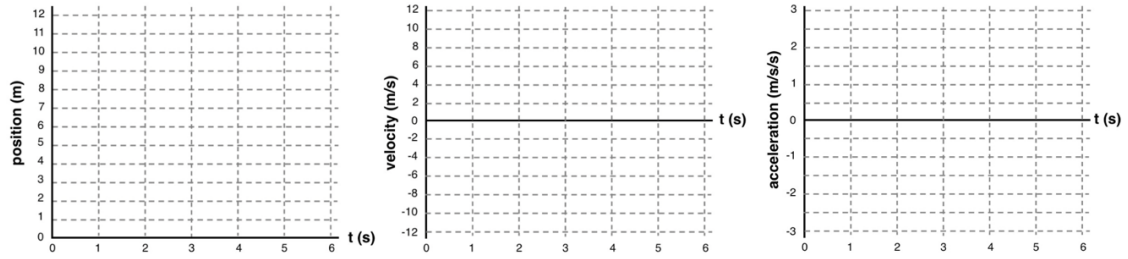
Motion Type 4: Move in + Direction; Slowing Down



Motion Type 5: Move in - Direction; Speeding Up



Motion Type 6: Move in - Direction; Slowing Down



Part 2: Drawing Generalizations About Motion Types and Graph Features

1. For **position-time graphs**: how do the lines on a p-t graph for **constant speed** differ from the lines for **changing speed**?

2. For **position-time graphs**: how do the lines on a p-t graph for **moving in the + direction** differ from the lines for **moving in the - direction**?

3. For **position-time graphs**: how do the lines on a p-t graph for **speeding up (getting faster)** differ from the lines for **slowing down (getting slower)**?

4. Experiment further with Motion Types 1 and 2 (the two constant speed motions). Modify the initial velocity a sufficient number of times in order to answer the question … For **position-time graphs**: how do the lines on a p-t graph for a **high speed motion** differ from the lines for a **low speed motion**?

5. For **velocity-time graphs**: how do the lines on a v-t graph for **constant speed** differ from the lines for **changing speed**?

6. For **velocity -time graphs**: how do the lines on a v-t graph for **moving in the + direction** differ from the lines for **moving in the - direction**?

7. For **velocity -time graphs**: how do the lines on a v-t graph for **speeding up (getting faster)** differ from the lines for **slowing down (getting slower)**? Provide an answer that is thorough enough to apply for motions in both directions.

8. Experiment further with Motion Types 1 and 2 (the two constant speed motions). Modify the initial velocity a sufficient number of times in order to answer the question … For **velocity-time graphs**: how do the lines on a v-t graph for a **high speed motion** differ from the lines for a **low speed motion**? Provide an answer that is thorough enough to apply for motions in both directions.

9. For **acceleration -time graphs**: what do all the a-t graphs have in common?

10. For **acceleration -time graphs**: how do the lines on an a-t graph for **constant speed** differ from the lines for **changing speed**?

11. Experiment further with Motion Types 3-6 as necessary in order to answer the question … For **acceleration -time graphs**: what characteristic of the motion would determine whether the line is above or below the time axis?