

The speed vs. time graph for changing motion

Speeding up and slowing down

The graphs you have been learning about until now have all shown motion at a constant speed. But objects rarely move at the same speed for a long period of time. A speed vs. time graph is useful for showing the motion of an object that is speeding up or slowing down. If a speed vs. time graph slopes up, then the speed is increasing. If it slopes down, then the speed is decreasing. If the graph is horizontal, then the object is moving at a constant speed.

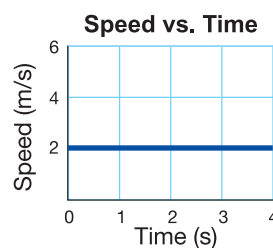
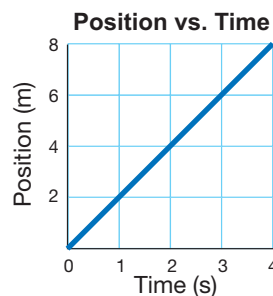
The graphs in Figure 12.13 show the motion of three different cars for 10 seconds. Each begins at a speed of 20 m/s. The first car moves at a constant 20 m/s for the entire 5 seconds. The second car speeds up from 20 m/s to 30 m/s. The third car slows down from 20 m/s to 10 m/s.

Drawing a speed vs. time graph

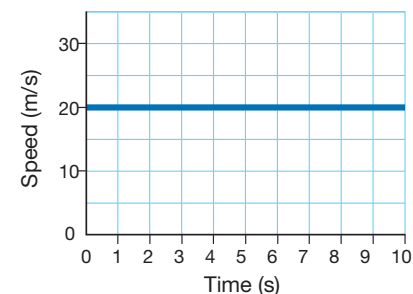
Draw a speed vs. time graph that shows the same motion as the position vs. time graph to the right.

- Looking for: You are asked to draw a speed vs. time graph.
- Given: You are given the position vs. time graph.
- Relationships: Speed equals the slope of the position vs. time graph.
- Solution: The object is moving at a constant speed. The slope equals the rise divided by the run.

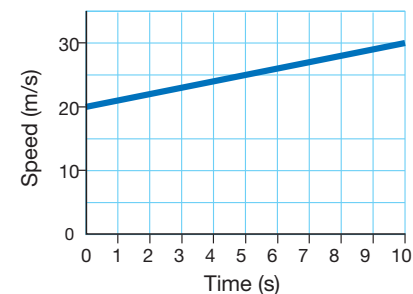
$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{8 \text{ m}}{4 \text{ s}} = 2 \text{ m/s}$$



Constant Speed



Speeding Up



Slowing Down

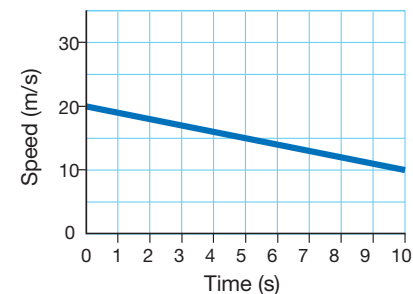


Figure 12.13: A speed vs. time graph can show you whether an object is speeding up, slowing down, or moving at a constant speed.