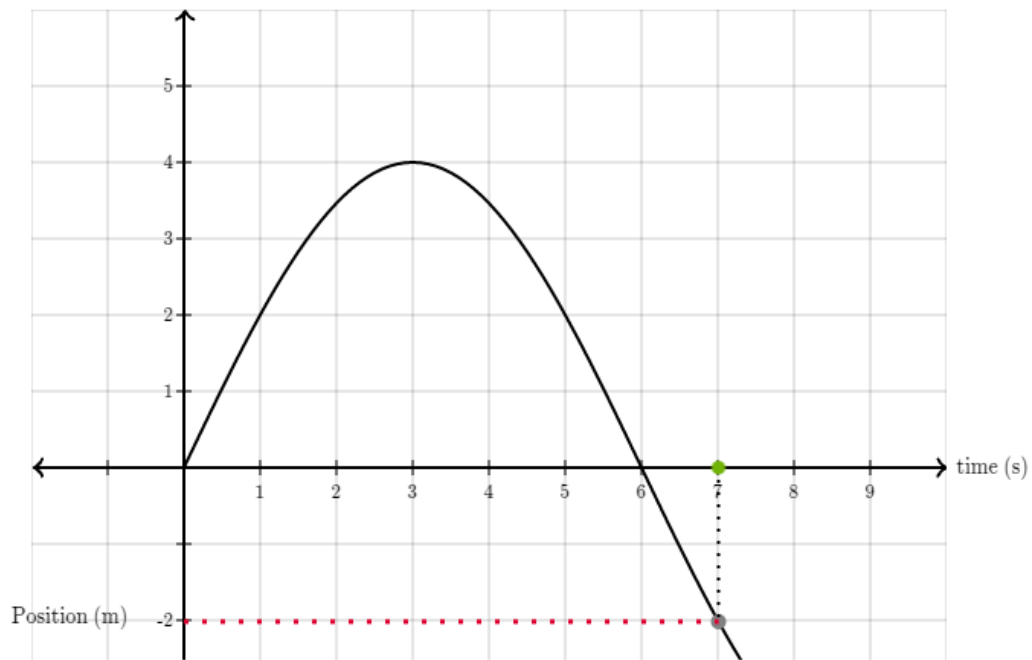
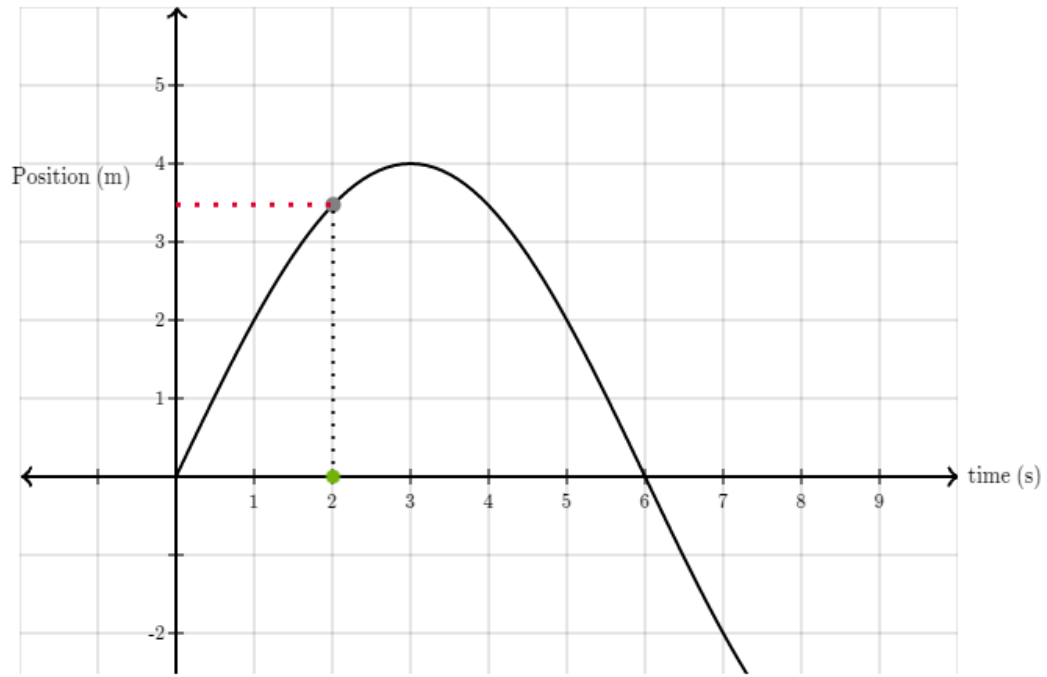


Interpreting x vs t Graph

Position vs time graphs show how an object's position is changing with time.

We can read an object's position at any time by following the point on the curve over to the y axis to determine its position at that time.

Look at the two examples below which show how to read the position of the object using a point in time.



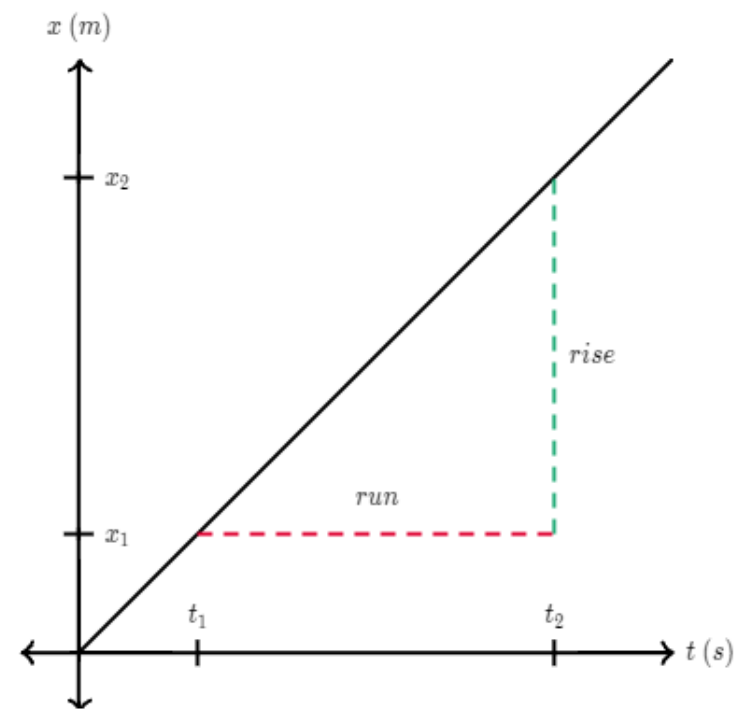
Concept check: What is the position of the object at time $t = 5$ seconds according to the graph above?

What does the slope represent on a position graph?

The slope of a position graph represents the velocity of the object. So the value of the slope at a particular time represents the velocity of the object at that instant.

To see why, consider the slope of the position vs. time graph shown below:

[\[Wait, why is the vertical axis called x?\]](#)



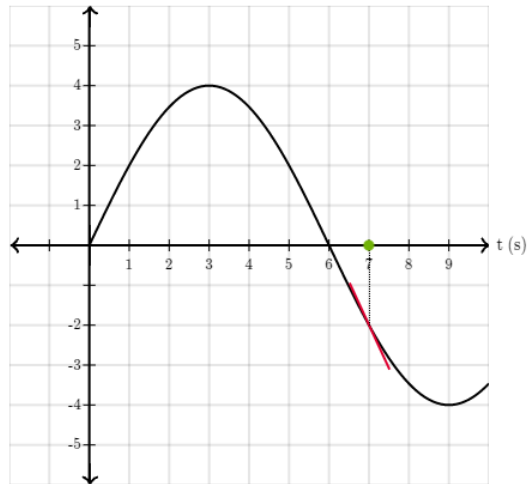
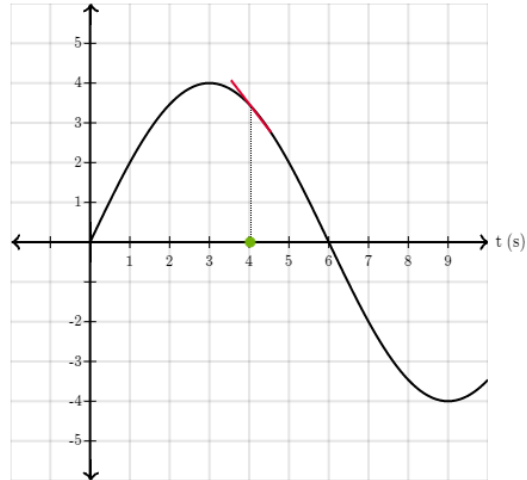
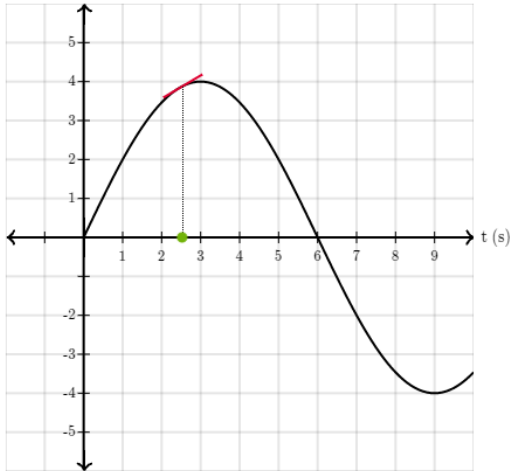
The slope of this position graph is $\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{x_2 - x_1}{t_2 - t_1}$.

This expression for slope is the same as the definition of velocity:

$v = \frac{\Delta x}{\Delta t} = \frac{x_2 - x_1}{t_2 - t_1}$. So the slope of a position graph has to equal the velocity.

This is also true for a position graph where the slope is changing.

Let's look at a few of examples of how to use the slope of a tangent line to find the velocity at any instant in time on the position-time graph.



Notice that in this case the slope of the tangent line changes with time, so this means that the velocity is changing with time. This is acceleration.

In the first graph the slope is positive, so the object's velocity is positive, which means it moves in the positive direction. The value of the slope is the speed. In the next two graphs, the slope is negative, which indicates that the object is moving in the negative direction. In the third graph, the slope is a little steeper than in the second graph. This indicates that the speed is greater at 7 seconds that it is at 4 seconds. We measure the speed by the slope's steepness.

