

Instantaneous Velocity and Speed



Earlier, we defined **Average velocity**: between time moments t_i and t_f :

$$v = \frac{\Delta x}{\Delta t}$$

x_i, x_f - initial and final positions.

displacement : $\Delta x = x_f - x_i$

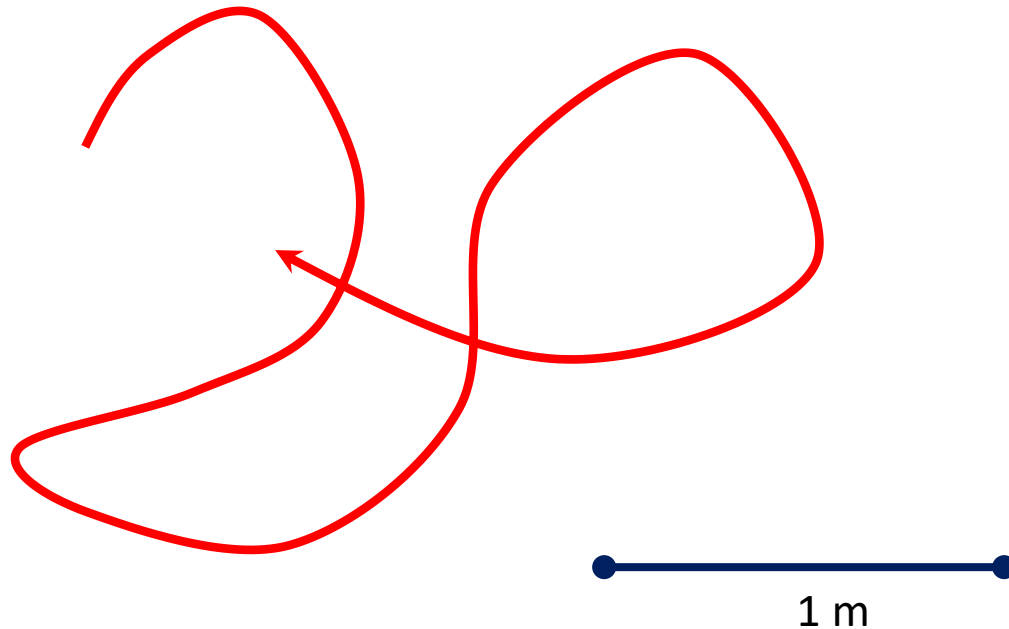
travel time : $\Delta t = t_f - t_i$

Instantaneous velocity tells you how fast an object moves *right now*, at specific time moment t . The formula is the same as above but **Δt must be as small as possible**. Similarly we can define **instantaneous speed**.

Homework

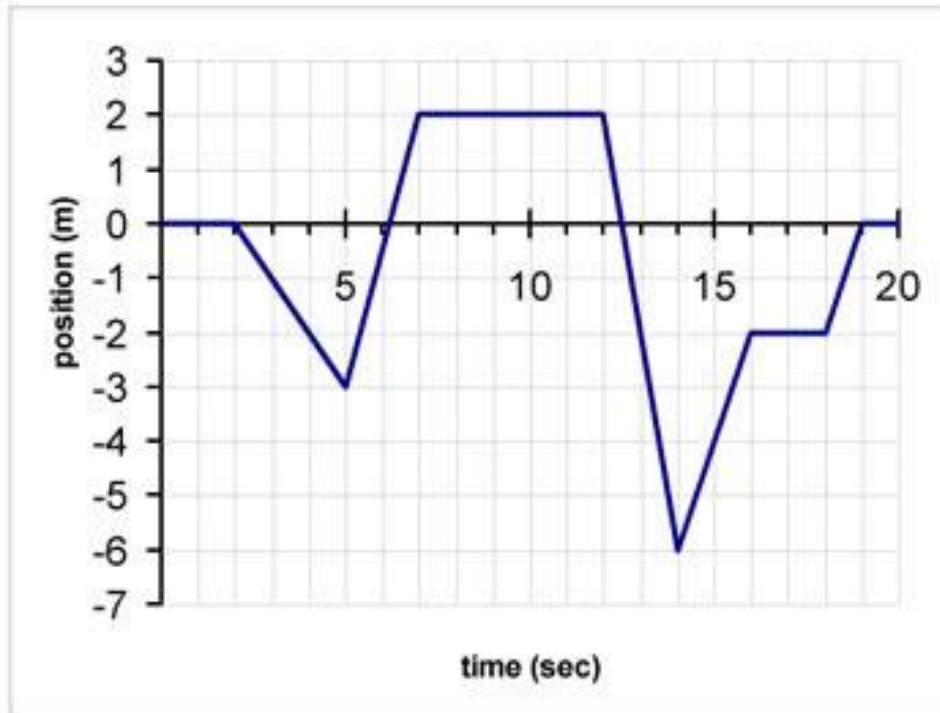
Problem 1.

The picture shows the path of an ant that it covered in 1 minute. Find its average speed. You will need to come up with a creative way to measure the distance travelled. Please describe it. Use anything you want.



Problem 2.

The figure below shows the position of a robot walking back and forth along a straight line. Find its instantaneous speed and velocity at each time interval and fill the table on the right. Also, find the average speed and velocity of the robot (you'll need to figure out the total distance travelled for this).



Time interval ,s	Speed, m/s	Velocity, m/s
0-2		
2-5		
5-7		
7-12		
12-14		
14-16		
16-19		
19-20		
20-21		
Average (0-21)		