

Task. The position of a particle moving along a coordinate line is $s = \sqrt{4 + 12t}$, with s in meters and t in seconds. Find the particle's velocity at $t = 1$ sec.

Solution. By definition, the velocity of a particle whose disposition at time t is given by some function $s(t)$ is equal to $s'(t)$:

$$v(t) = s'(t).$$

In our case

$$s = \sqrt{4 + 12t},$$

so

$$v(t) = s'(t) \left(\sqrt{4 + 12t} \right) = \frac{(4 + 12t)'}{2\sqrt{4 + 12t}} = \frac{12}{2 * 2\sqrt{1 + 3t}} = \frac{3}{\sqrt{1 + 3t}}.$$

For $t = 1$,

$$v(1) = \frac{3}{\sqrt{1 + 3 * 1}} = \frac{3}{\sqrt{4}} = \frac{3}{2} = 1.5 \text{ m/s}.$$

Answer. $v(1) = 1.5$ m/s.