

Worksheet 4. What You Need to Know About Motion Along the x -axis (Part 2)

- Speed is the absolute value of velocity.
- If the velocity and acceleration have the same sign (both positive or both negative), then speed is increasing.
- If the velocity and acceleration are opposite in sign (one is positive and the other is negative), then speed is decreasing.

There are three ways to use an integral in the study of motion that are easily confused. Watch out!

- $\int v(t) dt$ is an indefinite integral. It will give you an expression for position at time t . Don't forget that you will have a constant, the value of which can be determined if you know a position value at a particular time.

- $\int_{t_1}^{t_2} v(t) dt$ is a definite integral and so the answer will be a Number. The number represents the change in position over the time interval. By the Fundamental Theorem of Calculus, since $v(t) = x'(t)$, the integral will yield $x(t_2) - x(t_1)$. This is also known as displacement. The answer can be positive or negative depending upon if the particle lands to the right or left of its original starting position.

- $\int_{t_1}^{t_2} |v(t)| dt$ is also a definite integral and so the answer will be a number. The number represents the total distance travelled by the particle over the time interval. The answer should always be positive.

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$$\int_0^2 |v(t)| dt$$

$$\int_0^{1.57} v(t) dt + \int_{1.57}^2 v(t) dt$$