$$\boxed{\text{speed} = |\text{velocity}|}$$

To justify that speed is increasing, you must demonstrate one of the two following concepts:

I. The derivative of speed is positive: $\left[|v(t)|\right]' = \dfrac{v(t)}{|v(t)|} \cdot v'(t) > 0$

II. $v(t)$ and $a(t)$ have the same sign.

$$\text{speed increasing} \begin{cases} \leftarrow \text{moving} & \text{moving} \rightarrow \\ \leftarrow \text{accelerating} & \text{accelerating} \rightarrow \end{cases} \text{speed increasing}$$

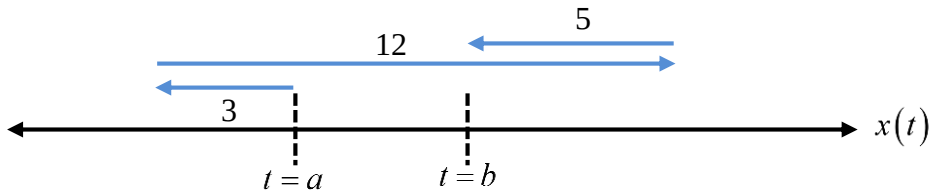
To justify that speed is decreasing, you must demonstrate one of the two following concepts:

I. The derivative of speed is negative: $\left[|v(t)|\right]' = \dfrac{v(t)}{|v(t)|} \cdot v'(t) < 0$

II. $v(t)$ and $a(t)$ have opposite signs.

$$\begin{matrix} \leftarrow \text{moving} \\ \text{accelerating} \rightarrow \end{matrix} \quad \text{or} \quad \begin{matrix} \text{moving} \rightarrow \\ \leftarrow \text{accelerating} \end{matrix}$$

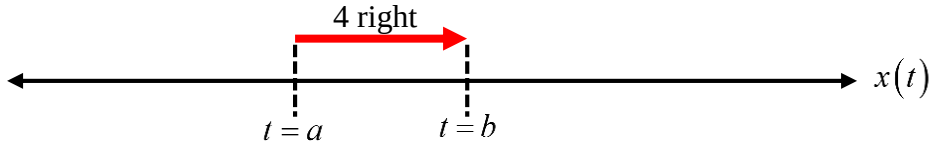
$\int_a^b v(t)\,dt$	$\int_a^b \lvert v(t)\rvert\,dt$
Represents net change in position from *a* to *b*.	Represents total distance traveled from *a* to *b*.



Total distance traveled is:

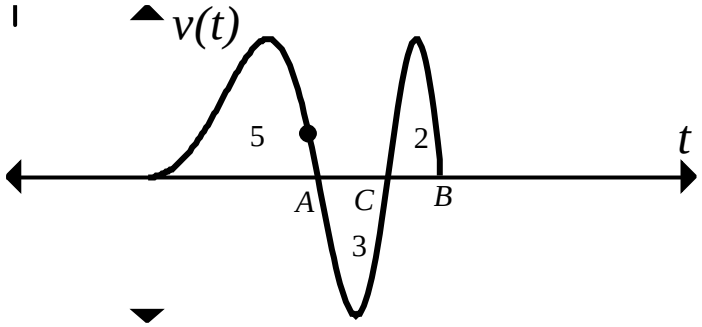
The total distance travelled is $3+12+5=20$ units.

Net change in position is the amount of distance moved to the left, or to the right when comparing the position at time *a* to the position at time *b*.



The net change in position from time *a* to time *b* is 4 units to the right.

A particle moves along the *x*-axis with its velocity graph given at right. The particle is at $x = 3$ when $t = B$.



Is the speed of the particle increasing, decreasing, or neither increasing nor decreasing at the given point on the graph above? Justify your answer.

Write an expression, involving an integral, that gives the total distance travelled by the particle from $t = A$ to $t = B$, and find its value.

Write an expression involving an integral for the position of the particle at time $t = C$, and find its value.