A particle moves in a straight line with position function \( s(t) = 6t - t^2 \) for \( 0 \leq t \leq 6 \). For convenience, I will assume that time, \( t \), is measured in seconds, and distance \( s \) is measured in meters.

1. Determine the average velocity on this interval. Solution.

\[
\text{average velocity} = \frac{\Delta s}{\Delta t} = \frac{s(6) - s(0)}{6 - 0} = \frac{(36 - 36 - (0 - 0))}{6} = 0.
\]

2. Determine the initial and final velocity (not speed!) for the particle. Solution.

\[
v(t) = s'(t) = 6 - 2t.
\]

Therefore,

\[
s'(0) = v_{\text{INIT}} = v(0) = 6,
\]

and

\[
s'(6) = v_{\text{FIN}} = v(6) = 6 - 2 \cdot 6 = -6.
\]

3. When (if ever) does the particle change directions? Solution.

\[
v(t) = s'(t) = 6 - 2t.
\]

The particle changes direction when \( v(t) = 0 \).

\[
6 - 2t = 0,
\]

\[
6 = 2t,
\]

\[
t = 3.
\]