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Calculus Worksheet: Motion Problems (1)

A particle moving along a straight line has an acceleration $a=4 t$. When $t=0$, the velocity $v$ of the particle and its position $s$ are respectively equal to 3 and 4 . Find its position $s$ as a function of time $t$.

$$
\begin{aligned}
& V(t)=\int a d t=\int(4 t) d t=4 \frac{t^{2}}{2}+C . \\
& V(0)=3 \Rightarrow 4(0)+c=3 \Rightarrow C=3 . \\
& V(t)=2 t^{2}+3 . \\
& S(t)=\int\left(2 t^{2}+3\right) d t=2 \cdot \frac{t^{3}}{3}+3 t+k . \\
& \begin{aligned}
& S(0)=4 \Rightarrow 2 .(0)+3(0)+k=4 \\
& \Rightarrow k=4 .
\end{aligned}
\end{aligned}
$$

$$
S(t)=\frac{2}{3} t^{3}+3 t+4
$$

