
2. A particle moves along the $x$-axis with velocity given by $v(t)=\frac{10 \sin \left(0.4 t^{2}\right)}{t^{2}-t+3}$ for time $0 \leq t \leq 3.5$.

The particle is at position $x=-5$ at time $t=0$.
(a) Find the acceleration of the particle at time $t=3$.

$$
v^{\prime}(3)=-2.1182
$$

(b) Find the position of the particle at time $t=3$.
$-5+\int_{0}^{3} v(t) d t=-1.7602$
(c) Evaluate $\int_{0}^{3.5} \nu(t) d t$, and evaluate $\int_{0}^{3.5}|\nu(t)| d t$. Interpret the meaning of each integral in the context of the problem.

$$
\begin{aligned}
& \int_{0}^{3.5} v(t) d t=2.8439 \text {, which is the displacement of the particle from } \\
& \qquad t=0 \text { to } t=3.5
\end{aligned}
$$

$\int_{0}^{3.5}|v(t)| d t=3.7371$, which is the total distance the particle traveled from $t=0$ to $t=3.5$
(d) A second particle moves along the $x$-axis with position given by $x_{2}(t)=t^{2}-t$ for $0 \leq t \leq 3.5$. At what time $t$ are the two particles moving with the same velocity?

$$
\begin{aligned}
v(t) & =2 t-1 \\
t & =1.5705
\end{aligned}
$$

