Problem statement A charged particle moves along the x-axis under the influence of an electric field. The field strength varies with time, and as a result the velocity of the particle is complicated. The position of the particle at time t is written as $x = x(t)$ and the velocity of the particle at time t is written as $v = v(t)$.
Suppose we know that $x(0) = 0$, and also that

$$v(t) = \begin{cases} 2t - 1, & \text{if } 0 \leq t \leq 1 \\ 4t - 3, & \text{if } 1 \leq t \leq 2 \\ 6t - 7, & \text{if } 2 \leq t \leq 3 \end{cases} .$$

What is $x(1)$? What is $x(2)$? What is $x(3)$? Sketch the graphs of $x = x(t)$ and $v = v(t)$.