12 A particle P travels in a straight line so that, t seconds after passing through a fixed point O, its velocity, $v\,\text{ms}^{-1}$, is given by

$$v = \frac{t}{2\text{e}} \qquad \text{for } 0 \leqslant t \leqslant 2,$$

$$v = \text{e}^{-\frac{t}{2}} \qquad \text{for } t > 2\ .$$

Given that, after leaving O, particle P is never at rest, find the distance it travels between $t = 1$ and $t = 3$. [6]

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