A particle $P$ of mass 2 kg moves along a horizontal straight line. The point $O$ is a fixed point on this line. At time $t$ s the velocity of $P$ is $v\,\text{m s}^{-1}$ and the displacement of $P$ from $O$ is $x$ m.

A force of magnitude $\left(8x - \frac{128}{x^3}\right)$ N acts on $P$ in the direction $OP$. When $t = 0$, $x = 8$ and $v = -15$.

**(a)** Show that $v = -\frac{2}{x}(x^2 - 4)$. [5]

**(b)** Find an expression for $x$ in terms of $t$. [4]