A particle P of mass $2\,\text{kg}$ moving on a horizontal straight line has displacement $x\,\text{m}$ from a fixed point O on the line and velocity $v\,\text{m s}^{-1}$ at time $t\,\text{s}$. The only horizontal force acting on P is a variable force $F\,\text{N}$ which can be expressed as a function of t. It is given that

$$\frac{v}{x} = \frac{3-t}{1+t}$$

and when $t = 0$, $x = 5$.

(a) Find an expression for x in terms of t. [4]

(b) Find the magnitude of F when $t = 3$. [3]