**12** A curve has parametric equations $x = \dfrac{1}{t}$, $y = 2t$. The point $P$ is $\left(\dfrac{1}{p}, 2p\right)$.

**(a)** Show that the equation of the tangent at $P$ can be written as $y = -2p^2x + 4p$. [4]

The tangent to this curve at $P$ crosses the $x$-axis at the point $A$ and the normal to this curve at $P$ crosses the $x$-axis at the point $B$.

**(b)** Show that the ratio $PA:PB$ is $1:2p^2$. [8]