

- 8** A cylindrical tank is initially full of water. There is a small hole at the base of the tank out of which the water leaks.

The height of water in the tank is  $x$  m at time  $t$  seconds. The rate of change of the height of water may be modelled by the assumption that it is proportional to the square root of the height of water.

When  $t = 100$ ,  $x = 0.64$  and, at this instant, the height is decreasing at a rate of  $0.0032 \text{ ms}^{-1}$ .

**(a)** Show that  $\frac{dx}{dt} = -0.004\sqrt{x}$ . **[2]**

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

**(c)** Hence determine at what time, according to this model, the tank will be empty. **[2]**