



A water tank has vertical sides and a horizontal rectangular base, as shown in the diagram. The area of the base is 2 m^2 . At time $t = 0$ the tank is empty and water begins to flow into it at a rate of 1 m^3 per hour. At the same time water begins to flow out from the base at a rate of $0.2\sqrt{h} \text{ m}^3$ per hour, where $h \text{ m}$ is the depth of water in the tank at time t hours.

- (i) Form a differential equation satisfied by h and t , and show that the time T hours taken for the depth of water to reach 4 m is given by

$$T = \int_0^4 \frac{10}{5 - \sqrt{h}} \text{ d}h. \quad [3]$$

- (ii) Using the substitution $u = 5 - \sqrt{h}$, find the value of T . [6]