

Engineering Analysis & Numerical Methods

Example 2:- The tank is filled with water as shown in Fig. Find depth of water as a function of time.

$$\frac{dV}{dt} = Q_{in} - Q_{out}$$

$$\frac{dV}{dt} = -\sqrt{2gy} \frac{\pi (10)^2}{4}$$

$$\pi x^2 \frac{dy}{dt} = -\sqrt{2g} \frac{25}{10^2} \pi y^{1/2}$$

$$\left(\frac{3}{10}\right)^2 y^2 \frac{dy}{dt} = -\sqrt{2g} \frac{25}{10^2} y^{1/2}$$

$$y^{3/2} dy = -9.96 \times 10^{-6} dt$$

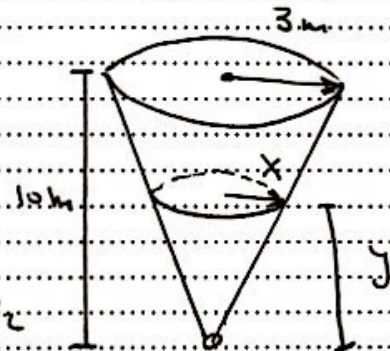
$$\frac{2}{5} y^{5/2} = -9.96 \times 10^{-6} t + C$$

at $t=0$ $y=10$

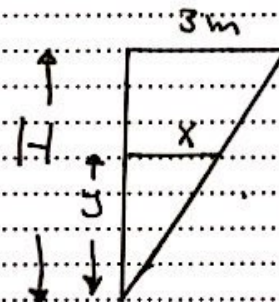
$$\frac{2}{5} (10)^{5/2} = 0 + C$$

$$\therefore C = \frac{2}{5} 10^{5/2}$$

$$\frac{2}{5} y^{5/2} = -9.96 \times 10^{-6} t + \frac{2}{5} 10^{5/2}$$



$d = 10 \text{ mm}$



$$\frac{y}{x} = \frac{10}{3}$$

$$\therefore x = \frac{3y}{10}$$