



$$V = \frac{1}{3} \pi r^2 h$$

$$V_0 = \frac{1}{3} \pi (6)^2 (5) = 47.12 \text{ m}^3 = 15$$

$$\frac{dV}{dt} = .02(2+h^2)$$

$$r = \frac{3}{5}h \quad \frac{dr}{dt} = \frac{3}{5} \frac{dh}{dt}$$

$$\frac{dV}{dt} = \frac{\pi}{3} \left[ r^2 \frac{dh}{dt} + 2rh \frac{dr}{dt} \right] = .02(2+h^2)$$

$$= \frac{\pi}{3} \left[ \left( \frac{3}{5}h \right)^2 \frac{dh}{dt} + 2 \left( \frac{3}{5}h \right) h \left( \frac{3}{5} \right) \frac{dh}{dt} \right] = .02(2+h^2)$$

$$= \frac{\pi}{3} \left[ \frac{9}{25} h^2 \frac{dh}{dt} + \frac{18}{25} h^2 \frac{dh}{dt} \right] = .02(2+h^2)$$

$$= \frac{\pi}{3} \left[ \frac{27}{25} h^2 \frac{dh}{dt} \right] = .02(2+h^2)$$

$$\frac{h^2}{2+h^2} \frac{dh}{dt} = \frac{.06}{\pi} \cdot \frac{25}{27}$$

$$t = ? \text{ When } V = .25 V_0$$

$$\frac{h^2}{2+h^2} \frac{dh}{dt} = \frac{1.5}{27\pi}$$

$$.25 V_0 = 15\pi(.25) = 3.75\pi = \frac{1}{3}\pi \left( \frac{3}{5}h \right)^2$$

$$3.75\pi = \frac{1}{3}\pi \left( \frac{9}{25} h^2 \right) h$$

$$31.25 = h^3$$

$$h = \sqrt[3]{31.25} = 3.15$$

$$\int_5^{3.15} \frac{h^2}{2+h^2} dh = \int_0^t \frac{1.5}{27\pi} dt$$

$$\left( h - \sqrt{2} \arctan\left(\frac{h}{\sqrt{2}}\right) \right) \leftarrow \text{Says wolfram alpha}$$

$$\left[ 3.15 - \sqrt{2} \arctan\left(\frac{3.15}{\sqrt{2}}\right) \right] - \left[ 5 - \sqrt{2} \arctan\left(\frac{5}{\sqrt{2}}\right) \right] = \frac{1.5}{27\pi} t$$

$$-89.9 - (-99.9) = 10 = \frac{1.5}{27\pi} t$$

$$t = 366 \text{ s} = \boxed{9.4 \text{ minutes}}$$