

Suppose that water is pouring into a swimming pool in the shape of a right circular cylinder at a constant rate of 5 cubic feet per minute. If the pool has radius 7 feet and height 9 feet, what is the rate of change of the height of the water in the pool when the depth of the water in the pool is 7 feet?

Solution

Because this is a right circular cylinder, we should expect that the height of the water will rise at a constant rate, therefore, the height of 9 feet is irrelevant.

$$\begin{aligned}V &= \pi * r^2 * h = \pi * 7^2 * h = \pi * 49h \\ \frac{dV}{dh} &= 49\pi \Rightarrow \frac{dV}{dt} * \frac{dt}{dh} = 49\pi \Rightarrow 5 * \frac{dt}{dh} = 49\pi \Rightarrow \frac{dt}{dh} = \frac{49\pi}{5} \\ \frac{dh}{dt} &= 5/(49\pi) = 0,032481 \text{ feet/min}\end{aligned}$$