Question:Suppose that water is pouring into a swimming pool in the shape of a right circular cylinder at a constant rate of 44 cubic feet per minute. If the pool has radius 44 feet and height 99 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 55 feet?

Solution: As the swiming pool has shape of circular cylinder, the answer doesn't depend on the depth of the water in the pool or the height of it. To solve this problem we should write

$$V = S \times X, where S = \pi R^2 (*)$$

after taking the time derivative from (*)

$$\frac{dV}{dt} = S \times \frac{dX}{dt}$$

accoding to the problem we know the rate k=$44\frac{f^3}{min}$, so $\frac{dV}{dt} = k$

$$k = S \times \frac{dX}{dt} (**)$$

from (**) we can find out $\frac{dX}{dt}$

$$\frac{dX}{dt} = \frac{k}{S} = \frac{k}{\pi R^2} \approx 0,0072 \frac{feet}{min}$$

Answer:$0,0072\frac{feet}{min}$