



Quiz # 4
Math 101-Section 01 Calculus I
20 October 2017, Friday
Instructor: Ali Sinan Sertöz
Solution Key



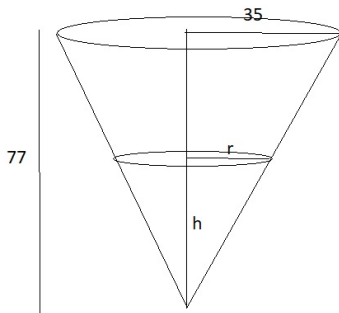
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Your Name:

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Q-1) Water runs into a tank which is in the shape of an upside-down cone with radius 35 cm and height 77 cm , at the constant rate of $100\pi\text{ cm}^3/\text{min}$. Suppose we started with the tank empty. What is the height of the water in the tank when the water level is increasing at the rate of $5\text{ cm}/\text{min}$? (10 points)

Solution:



We have $\frac{35}{77} = \frac{r}{h}$, which gives $r = \frac{35h}{77}$.

The volume of water in the tank at any moment is given by $V = \frac{\pi}{3} r^2 h = \frac{\pi}{3} \left(\frac{35h}{77}\right)^2 h = \frac{\pi}{3} \left(\frac{5}{11}\right)^2 h^3$.

Taking the derivative of the volume with respect to time, we get

$$V' = \frac{25\pi}{121} h^2 h'.$$

Putting in the values $V' = 100\pi$, $h' = 5$, we get

$$100\pi = \frac{125\pi}{121} h^2.$$

This gives

$$h = \frac{22}{\sqrt{5}}\text{ cm} \approx 9.8\text{ cm}.$$