Eddie Price **Quiz 12 Solutions** **Spring 2017**

High score: 10; Non-0 Low score: 2; Average score: 7.52 (including 0's)

Problem 1 (10 Points). A company is making a soup can with a volume of $V = \pi r^2 h$, where the radius is r cm and the height is h cm. Suppose the radius is currently 6 cm and the height is currently 12 cm. Also, suppose the company plans to increase the radius by 0.2 cm and decrease the height by 0.3 cm. Use differentials to estimate by how much the volume is changing, and state whether the volume is increasing or decreasing. (Round to 2 decimal places.)

Solution. We know $dV = \frac{\partial V}{\partial r}dr + \frac{\partial V}{\partial h}dh$, so we get $\Delta V \approx \frac{\partial V}{\partial r}\Delta r + \frac{\partial V}{\partial h}\Delta h$.

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

Also, $\Delta r = 0.2$ and $\Delta h = -0.3$ (since h is decreasing). And we know that $r = 6$ and $h = 12$. So we get

$$\Delta V \approx 2\pi r h \Delta r + \pi r^2 \Delta h$$
$$\Delta V \approx 2\pi\,(6)\,(12)\,(0.2) + \pi\,(6)^2\,(-0.3) \approx 56.55$$

So the volume $\boxed{\text{increases}}$ by about $\boxed{56.55 \text{ cm}^3}$.

Common Mistakes

None