WORKSHEET 3: **Related Rates** Jan 17, 2018

1. A baker rolls a dough that has a circular cylinder form. As he rolls, the shape remains a cylinder and it becomes thinner such that the radius of the dough is decreasing at a rate of $0.5\,cm/s$. How fast is the length increasing when radius is $10\,cm$ and length is $25\,cm$?

   a) Draw a picture of the situation at different times. (draw for 2 or 3 instants in time)

   b) Choose one of your pictures and based on the given solution, assign variables to the changing quantities.

   c) Answer the questions about the given solution.

   Solution:

   $V = \pi r^2 h$ — What's this formula? How would it help us? What are r and h?

   $0 = \pi(2\,r\,r'h + r^2 h')$ — Why 0? Where did this come from? Where did this come from?

   $0 = -\pi \times 2 \times 10 \times 0.5 \times 25 + \pi \times 100 \times h' \quad \Rightarrow h' = 2.5\,cm/sec$

   Why negative? Which quantities are they? → Do the computation ...

   d) How this question is different from Question 3 in worksheet #2?

$\star$ Include the units in your answer.

2. A rocket is launched on a vertical trajectory and is tracked by a radar station that is $3\,km$ from the launch pad.

   a) Find the vertical speed of the rocket at the instant when the distance from the rocket to the radar station is $5\,km$ and that distance is increasing at $5000\,km/h$.

   b) If the radar station is always kept aimed at the rocket, how fast is the angle of elevation changing at that same moment?

   (Hint: The angle of elevation is the angle that the line of sight in the radar station makes with the horizontal axis.)