Math 1100 — Calculus, Quiz #6A — 2009-11-16

A spherical snowball is melting. Its surface area decreases at a constant rate of $3 \text{ cm}^3/\text{min}$. At what rate is the *radius* of the snowball decreasing when its radius is 10 cm?

(**Hint:** *Area of sphere = $4\pi \ radius^2$*)

Solution: Let $r(t) =$ radius of snowball at time t. We want to solve for $r'(t)$ when $r(t) = 10$.

Let $A(t) =$ area of snowball at time t. Then we have $A(t) = 4\pi r(t)^2$. Thus,

$$A'(t) \quad = \quad 8\pi r(t) \cdot r'(t).$$

However, we are told that $A(t) = 3$, while $r(t) = 10$. We substitute this information to get:

$$3 \quad = \quad A'(t) \quad = \quad 8\pi r(t) \cdot r'(t) \quad = \quad 80\pi r'(t).$$

Solving, we have $r'(t) = \boxed{\dfrac{3}{80\pi}}$. $\qquad\qquad$ □