

### Problem 1 – Tootsie Pop or Charms Pop

1. Measure the circumference (inches) \_\_\_\_\_
2. Calculate the volume of the “candy” \_\_\_\_\_
3. Do NOT CHEW the experiment.
4. How long does it take you to get to the center of the “candy” (minutes)  
\_\_\_\_\_
5. Calculate the volume’s rate of change \_\_\_\_\_
6. Enjoy what is left of the experiment!

Related rates problems involve one or more variables that change over time. Since the derivatives in these problems will be taken with respect to time, rather than with respect to  $x$ , we will use implicit differentiation. Thus the statement “the radius increases at a rate of 5 feet per second” would be translated symbolically as

$$dr/dt = 5 \text{ feet/sec}$$

### Problem 2

Translate each statement into symbols.

- a. The radius of a sphere is increasing at a rate of 10 feet per second. \_\_\_\_\_
- b. The height of a cone is decreasing at a rate 6 inches per second. \_\_\_\_\_
- c. The angle of elevation is increasing at a rate of 12 radians per second. \_\_\_\_\_

### Problem 3

Differentiate each equation with respect to  $t$ .

- a)  $A = \pi r^2$  \_\_\_\_\_
- b)  $V = (4/3)\pi r^3$  \_\_\_\_\_
- c)  $V = \pi r^2 h$  \_\_\_\_\_
- d)  $\tan \theta = cy$  where  $c$  is a constant \_\_\_\_\_

### Problem 4

Given the graph of  $y = g'(x)$  on the interval  $[-2,2]$  below, provide a reasonable sketch of the graph of  $g$  for the same interval on these axes.

