# Chapter 2.4: Interpreting Derivatives

## Calculus I

**College of the Atlantic. October 10, 2024**

1. Let $V(t)$ be the volume, in gallons, of the water in the bathtub as a function of time in seconds.

   (a) What are the units of $V'(t)$?
   (b) What does $V'(t)$ indicate in practical terms?
   (c) What does it mean if $V'(t)$ is negative?
   (d) Sketch a possible $V(t)$ that corresponds to someone filling up the tub, taking a bath, and then draining the tub.
   (e) Sketch a possible $V'(t)$ that corresponds to someone filling up the tub, taking a bath, and then draining the tub.

2. Let $s(t)$ be the height of a sunflower plant, in centimeters, as a function of time. Let $t$ be measured in days since the seed germinates.

   (a) What is the meaning of $s(20)$?
   (b) What is the meaning of $s^{-1}(30)$?
   (c) What is the meaning of $s(12) = 7.8$?
   (d) What are the units of $s'(t)$?
   (e) What is the meaning of $s'(12) = 1.5$?
   (f) Based on the above, estimate the value of $s(14)$. Why is your answer only an estimate?
   (g) Using your knowledge of sunflowers, sketch a possible graph for $s(t)$.
   (h) Sketch a possible graph for $s'(t)$.

3. Let $f(r)$ give the area in $\text{cm}^2$ of a pizza as a function of its radius $r$ in cm.

   (a) Algebraically determine the derivative of $f(r)$ as a function of $r$.
   (b) What is the meaning of $f(5)$?
   (c) What is the meaning of $f^{-1}(200)$?
   (d) What is the meaning of $f'(6)$?
   (e) Why is $f'(6) > f'(5)$?

4. Let $g(v)$ be the fuel efficiency in mpg of a car traveling at $v$ miles per hour. What is the practical meaning of the statement:

$$g'(55) = -0.54 \text{ ?}$$