Math 135, Calculus 1, Fall 2020

11-04: Rates of Change (Section 3.4)

The **derivative** $f'(x)$ of a function $y = f(x)$ gives:

- the slope of the tangent line
- the instantaneous rate of change of y with respect to x

A. Rates of Change

Exercise 1. Find the rate of change, including units:

(a) Area of a square A in m^2 with respect to the length of a side s in m when $s = 3$.

(b) The diameter d of a circle in cm with respect to the radius r in cm.

(c) Volume V in ft^3 with respect to the radius in feet, if the height is equal to the radius.

Exercise 2. The dollar cost of producing x bagels, in thousands, is given by the function

$$C(x) = 50x^3 - 750x^2 + 3740x + 3750.$$

(a) What is the cost of producing 4000 bagels?

(b) Find the approximate cost of producing the 4001-st bagel.

(c) Compare your answer to Part (b) with the actual cost of producing the 4001-st bagel.

(d) What is the **average cost** of a bagel when producing 4000 bagels?

(e) The blue graph below depicts the average cost as a function of x, while the red depicts $C(x)$. At what level of production x_0 is the average cost smallest? What is the relationship between the average cost and the **marginal cost** at x_0?